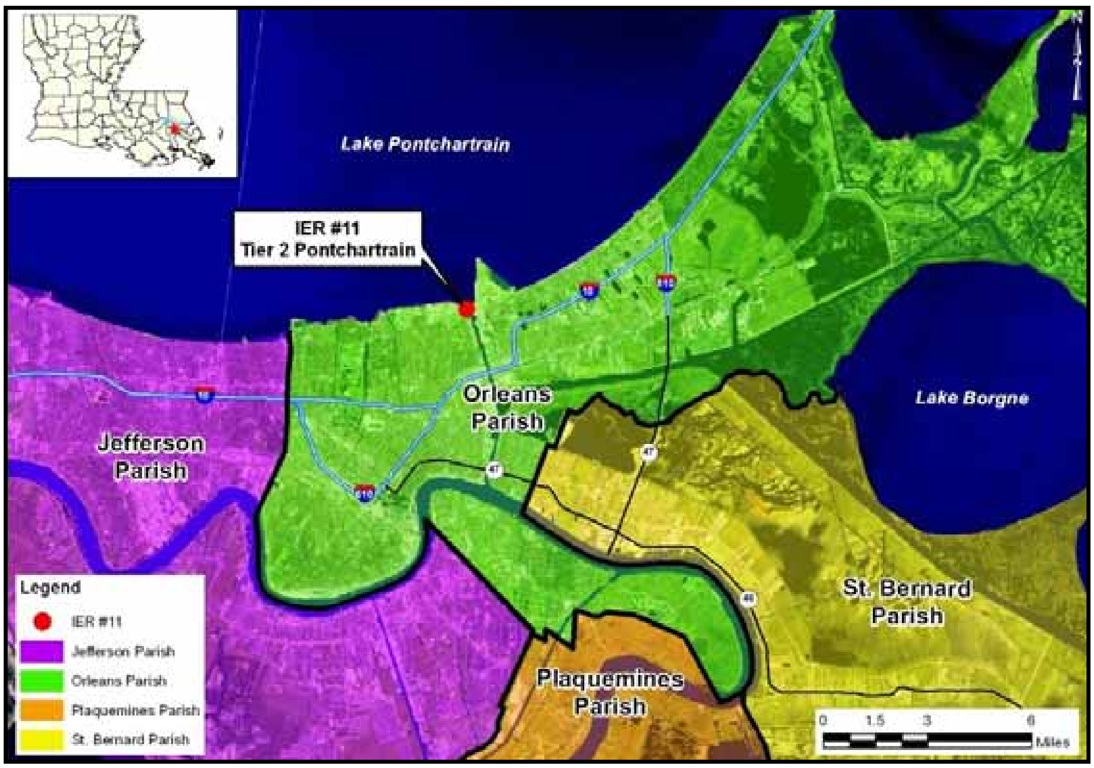
# DRAFT INDIVIDUAL ENVIRONMENTAL REPORT

## IMPROVED PROTECTION ON THE INNER HARBOR NAVIGATION CANAL

## ORLEANS PARISH, LOUISIANA

## IER #11 – TIER 2 PONTCHARTRAIN

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# 1.0 INTRODUCTION

The United States (U.S.) Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared this Individual Environmental Report (IER) #11 – Tier 2 Pontchartrain for Improved Protection on the Inner Harbor Navigation Canal (IHNC), Orleans Parish, Louisiana. This IER has been prepared as a second tier evaluation for the portion of the flood risk reduction project that occurs near Lake Pontchartrain and is referred to as "Tier 2 Pontchartrain." This document provides an evaluation of the potential impacts associated with the proposed construction of a storm surge risk reduction structure on the IHNC where it meets Lake Pontchartrain (figure 1). While officially the IHNC is a navigation channel, the use of the term "IHNC" for the purposes of this document include all of the waters and shoreline bounded on the east where the Mississippi River Gulf Outlet (MRGO) navigation channel and the Gulf Intracoastal Waterway (GIWW) diverge; to the south at the IHNC lock complex; and the north at the point where the IHNC intersects with Lake Pontchartrain.

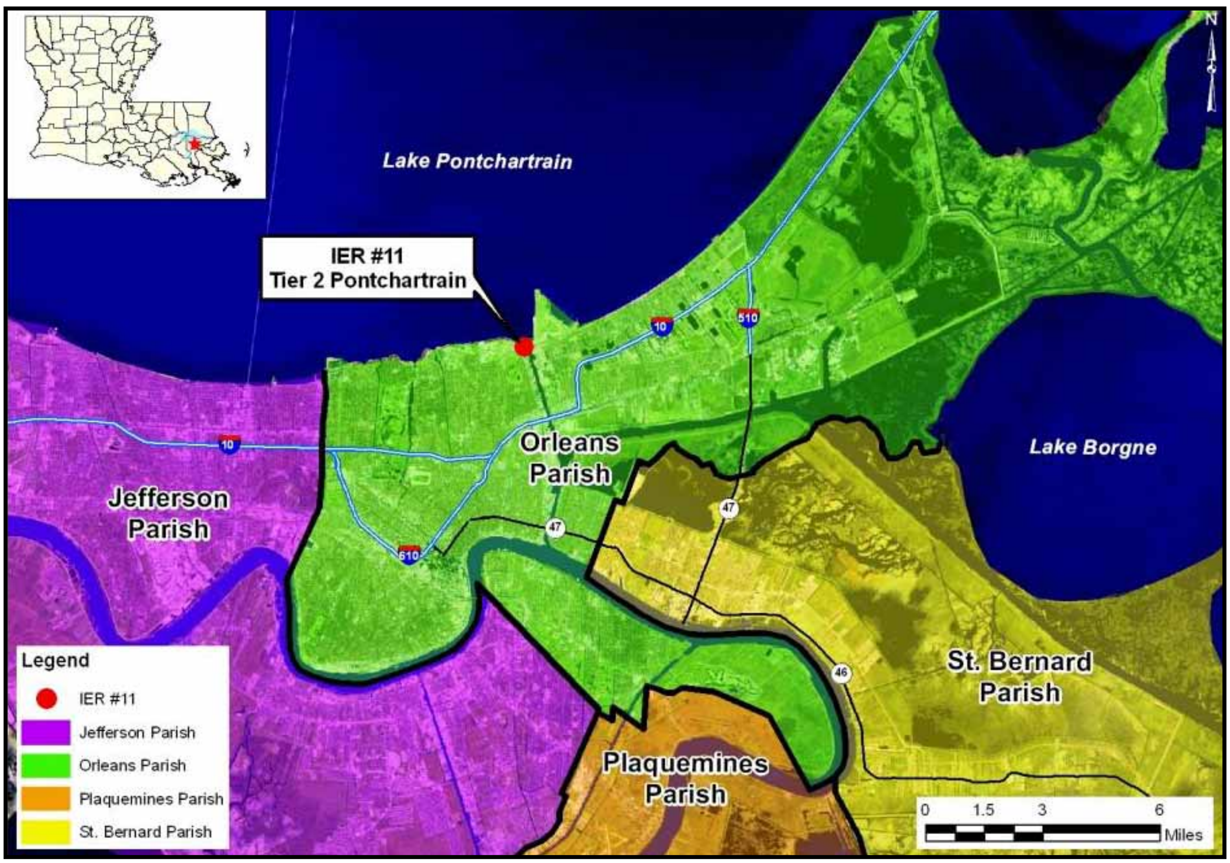



**Figure 1. IER #11 Tier 2 Pontchartrain Project Vicinity Map**

IER #11 – Tier 2 Pontchartrain has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality's (CEQ) Regulations (40 Code of Federal Regulations [CFR] 1500-1508), and the USACE Engineering Regulation (ER), ER 200-2-2 Environmental Quality, Procedures for Implementing NEPA (33 CFR 230). The execution of an IER, in lieu of a traditional Environmental Assessment (EA) or Environmental Impact Statement (EIS), is provided for in ER 200-2-2, Procedures for

Implementing NEPA (33 CFR 230), and pursuant to the CEQ Regulations for Implementing NEPA (40 CFR 1506.11). The Alternative Arrangements can be found at www.nolaenvironmental.gov, and are herein incorporated by reference.

The CEMVN implemented Alternative Arrangements on 13 March 2007, under the provisions of the CEQ Regulations for Implementing NEPA (40 CFR 1506.11). The Alternative Arrangements were developed and implemented in the aftermath of Hurricanes Katrina and Rita in order to evaluate environmental impacts arising from hurricane and storm damage risk reduction (HSDRRS) projects in a timely manner, utilizing the NEPA emergency procedures found at 40 CFR 1506.11. The Alternative Arrangements were published on 13 March 2007 in 72 FR 11337, and are available for public review at www.nolaenvironmental.gov.

The Alternative Arrangements were developed and implemented in order to expeditiously complete environmental analysis for any changes to the authorized system and the 100-year level of the HSDRRS, formerly known as the Hurricane Protection System (HPS), authorized and funded by Congress and the George W. Bush Administration.

The area described in this IER is located in southeastern Louisiana and is part of the Federal effort to rebuild and complete construction of the HSDRRS in the New Orleans Metropolitan area as a result of Hurricanes Katrina and Rita. This document, referred to as Tier 2 Pontchartrain, is a second tier document off the IER #11 "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana" (Tier 1) to address surges from the Lake Pontchartrain-IHNC-GIWW complex (hereafter referred to as "Pontchartrain complex"). Tiering is a staged approach to NEPA described in the CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508). The Tier 1 document investigates a range of alternatives for providing the 100-year level of risk reduction to communities surrounding the IHNC. The alternative selected included two location ranges, "Borgne 1" and "Pontchartrain 2," within which separate storm surge structures could be built to address storm surges originating from the MRGO-GIWW-Lake Borgne complex and Lake Pontchartrain, respectively. The first Tier 2 document, IER #11 Tier 2 Borgne, which investigates a range of alignments and design alternatives within the Borgne l location range, has been completed. This document, IER #11 Tier 2 Pontchartrain, provides a more detailed description and analysis of footprints and alignments, construction materials and methods, and other design details than what was provided in IER #11 Tier 1 for the Pontchartrain location range.

This draft IER will be distributed for a 30-day public review and comment period. A public meeting specific to the proposed action will be considered if requested during the review period. Any comments received during this public meeting would be considered part of the official record. After the 30-day comment period, and public meeting if held, the CEMVN District Commander will review all comments received during the review period and determine if they rise to the level of being substantive in nature. If comments are not considered to be substantive, the District Commander may make a decision on the proposed action. This decision will be documented in the form of an IER Decision Record. If a comment(s) is determined to be substantive in nature, an Addendum to the IER will be prepared and published for an additional 30-day public review and comment period. After the expiration of the public comment period the District Commander may make a decision on the proposed action. The decision will be documented in an IER Decision Record.

## 1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

It is the intent of the CEMVN to employ an integrated, comprehensive, and systems-based approach to hurricane and storm damage risk reduction by raising the HSDRRS to the 100-year level of risk reduction. The proposed action would satisfy the CEMVN's purpose and need to provide the 100-year level of risk reduction from flood damage due to flooding from hurricanes and other tropical storms in the New Orleans Metropolitan area. The term "100-year level of risk reduction," as it is used throughout this document, refers to a level of risk reduction which reduces the risk of hurricane surge and wave-driven flooding that the New Orleans Metropolitan Area has a 1 percent chance of experiencing each year.

The elevations of the existing Lake Pontchartrain and Vicinity (LPV) HSDRRS in the project area are below the 100-year design elevation. The proposed action resulted from a defined need to reduce flood risk and storm damage to residences, businesses, and other infrastructure from hurricanes (100-year storm events), and other high water events. The completed HSDRRS would lower the risk of damage to property and infrastructure during a storm event. The safety of people in the region is the highest priority of the CEMVN.

## 1.2 AUTHORITY FOR THE PROPOSED ACTION

The authority for the proposed action was provided as part of a number of HSDRRS projects spanning southeastern Louisiana, including the LPV project and the West Bank and Vicinity (WBV) project. Congress and the George W. Bush Administration granted a series of supplemental appropriations acts following Hurricanes Katrina and Rita to repair and upgrade the project systems damaged by the storms and gave additional authority to the USACE to construct 100-year HSDRRS projects.

The LPV project was authorized under the Flood Control Act of 1965 (Public Law [PL] 89-298, Title II, Sec. 204) as amended, which authorized a "project for hurricane protection on Lake Pontchartrain, Louisiana … substantially in accordance with the recommendations of the Chief of Engineers in House Document 231, Eighty-ninth Congress." The original statutory authorization for the LPV project was amended by the Water Resources Development Act (WRDA) of 1974 (PL 93-251, Title I, Sec. 92), 1986 (PL 99-662, Title VIII, Sec. 805), 1990 (PL 101-640, Sec. 116), 1992 (PL 102-580, Sec. 102), 1996 (PL 104-303, Sec. 325), 1999 (PL 106-53, Sec. 324), and 2000 (PL 106-541, Sec. 432); and the Energy and Water Development Appropriations Acts of 1992 (PL 102-104, Title I, Construction, General), 1993 (PL 102-377, Title I Construction, General), and 1994 (PL 103-126, Title I Construction, General).

The Department of Defense, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic Influenza Act of 2006 (3rd Supplemental - PL 109-148, Chapter 3, Construction, and Flood Control and Coastal Emergencies) appropriated funds to accelerate the completion of the previously authorized project and to restore and repair the project at full Federal expense. The Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery of 2006 (4th Supplemental - PL 109-234, Title II, Chapter 3, Construction, and Flood Control and Coastal Emergencies) appropriated funds and added authority to raise levee heights where necessary, reinforce and replace floodwalls, and otherwise enhance the project to provide the levels of risk reduction necessary to achieve the certification required for participation in the National Flood Insurance Program. Additional Supplemental Appropriations include the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007 (PL 110-28) Title IV, Chapter 3, Flood Control and Coastal Emergencies, Section 4302 (5th Supplemental), and the 6th Supplemental (PL 110-252), Title III, Chapter 3, Construction.

## 1.3 PRIOR REPORTS

A number of studies and reports on water resources development in the proposed action area have been prepared by the USACE, other Federal, state, and local agencies, research institutes, and individuals. Pertinent studies, reports, and projects not previously discussed in IER #11 Tier 2 Borgne are summarized below:

- On 29 October 2009, the CEMVN Commander signed a Decision Record on Individual Environmental Report Supplemental (IERS) #2 entitled "Lake Pontchartrain and Vicinity, West Return Floodwall, Jefferson and St. Charles Parishes, Louisiana." The supplemental document evaluates the potential effects associated with proposed project revisions to the original IER #2.

- On 28 September 2009, the CEMVN Commander signed a Decision Record on IER #30 entitled "Contractor-Furnished Borrow Material #5, St. Bernard and St. James Parishes, Louisiana, and Hancock County, Mississippi." The document evaluates the potential impacts associated with the possible excavation of three proposed contractor-furnished borrow areas.

- On 8 September 2009, the CEMVN Commander signed a Decision Record on IER #29 entitled "Contractor Furnished Borrow Material #4, Orleans, St. John the Baptist, and St. Tammany Parishes, Louisiana." The document evaluates the potential effects associated with the possible excavation of three proposed contractor-furnished borrow areas.

- On 30 June 2009, the CEMVN Commander signed a Decision Record on IER #5 entitled "Lake Pontchartrain and Vicinity, Permanent Protection System for the Outfall Canals Project on 17th Street, Orleans Avenue, and London Avenue Canals, Jefferson and Orleans Parishes, Louisiana." The document evaluates the potential effects associated with the construction and maintenance of a permanent risk reduction system for the 17th Street, Orleans Avenue, and London Avenue Canals.

- On 29 June 2009, the CEMVN Commander signed a Decision Record on IERS #1 entitled "Lake Pontchartrain and Vicinity, LA Branche Wetlands Levee, St. Charles Parish, Louisiana." The supplemental document evaluates the potential effects associated with revisions to the original proposed action in IER #1.

- On 25 June 2009, the CEMVN Commander signed a Decision Record on IER #6 entitled "Lake Pontchartrain and Vicinity, New Orleans East Citrus Lakefront Levee, Orleans Parish, Louisiana." The document evaluates the potential effects associated with proposed improvements to three reaches of the East Orleans Hurricane Risk Reduction Levee that were originally constructed as part of the LPV project.

- On 23 June 2009, the CEMVN Commander signed a Decision Record on IER #8 entitled "Lake Pontchartrain and Vicinity, Bayou Dupre Control Structure, St. Bernard Parish, Louisiana." The document evaluates the potential effects associated with the proposed replacement of a flood control structure on Bayou Dupre.

- On 19 June 2009, the CEMVN Commander signed a Decision Record on IER #7 entitled "Lake Pontchartrain and Vicinity, New Orleans Lakefront to Michoud Canal, Orleans Parish, Louisiana." The document evaluates the potential effects associated with proposed improvements to three reaches of the East Orleans Hurricane Risk Reduction Levee that were originally constructed as part of the LPV project.

- On 26 May 2009, the CEMVN Commander signed a Decision Record on IER #10 entitled "Lake Pontchartrain and Vicinity, Chalmette Loop Levee, St. Bernard Parish, Louisiana." The document evaluates the potential impacts associated with the proposed construction of a T-wall floodwall on top of the existing Chalmette Loop levee.

- On 13 March 2009, the CEMVN Commander signed a Decision Record on IER #4 entitled "Lake Pontchartrain and Vicinity, New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal, Orleans Parish, Louisiana." The document evaluates the potential impacts associated with a proposed action that would include changes involving multiple gates and ramps, as well as a sector gate structure along the south shore of Lake Pontchartrain.

- On 18 February 2009, the CEMVN Commander signed a Decision Record on IER #12 entitled "GIWW, Harvey, and Algiers Levees and Floodwalls, Jefferson, Orleans, and Plaquemines Parishes, Louisiana." The document was prepared to evaluate potential impacts associated with the proposed construction and upgrades of levees, floodwalls, floodgates, and pumping station(s) within a portion of the WBV HSDRRS.

- On 3 February 2009, the CEMVN Commander signed a Decision Record on IER #25 entitled "Government Furnished Borrow Material #3, Orleans, Jefferson, and Plaquemines Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the possible excavation of four Government Furnished borrow areas.

- On 21 October 2008, the CEMVN Commander signed a Decision Record on IER #11 Tier 2 Borgne entitled "Improved Protection on the Inner Harbor Navigation Canal, Tier 2 Borgne Orleans and St. Bernard Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with constructing a surge barrier on Lake Borgne.

- On 20 October 2008, the CEMVN Commander signed a Decision Record on IER #26 entitled "Pre-Approved Contractor Furnished Borrow Material #3, Jefferson, Plaquemines, and St. John the Baptist Parishes, Louisiana, and Hancock County, Mississippi." The document was prepared to evaluate the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 26 August 2008, the CEMVN Commander signed a Decision Record on IER #14, entitled "Westwego to Harvey Levee, Jefferson Parish, Louisiana." The proposed action includes enlarging earthen levees, rebuilding floodwalls, constructing fronting protection for three pump stations, replacing a floodgate with a swing gate, and raising an existing ramp to ensure a continuous line of risk reduction in the levee and floodwall system.

- On 25 July 2008, the CEMVN Commander signed a Decision Record on IER #3, entitled "Lake Pontchartrain and Vicinity, Lakefront Levee, Jefferson Parish, Louisiana." The proposed action includes the rebuilding of 9.5 miles of earthen levees, upgrading of foreshore protection, replacement of two floodgates, and construction of fronting protection and construction or modification of breakwaters at four pumping stations along the lakefront in Jefferson Parish, Louisiana.

- On 18 July 2008, the CEMVN Commander signed a Decision Record on IER #2, entitled "Lake Pontchartrain and Vicinity, West Return Floodwall, Jefferson and St. Charles Parishes, Louisiana." The proposed action includes replacing 3.4 miles of floodwall in Jefferson and St. Charles Parishes, Louisiana.

## 1.4 INTEGRATION WITH OTHER INDIVIDUAL ENVIRONMENTAL REPORTS

In addition to this IER, the CEMVN is preparing a draft Comprehensive Environmental Document (CED) that will describe the work completed and the work remaining to be constructed. The purpose of the draft CED will be to document the work completed by the

CEMVN on a system-wide scale. The draft CED will describe the integration of individual IERs into a systematic planning effort. Overall cumulative impacts and future operation, maintenance, rehabilitation, repair, and replacement (OMRR&R) requirements will also be included. Additionally, the draft CED will contain updated information for any IER that had incomplete or unavailable data at the time it was posted for public review.

A public scoping meeting for the CED was held in New Orleans, Louisiana on 2 September 2009. Once completed, a draft CED will be available for a 60-day public review period. The document will be posted on www.nolaenvironmental.gov, or it can be requested by contacting the CEMVN. A notice of availability will be mailed/e-mailed to interested parties advising them of the availability of the draft CED for review. Additionally, a notice will be placed in national and local newspapers. Upon completion of the 60-day review period, all comments will be compiled and appropriately addressed. Upon resolution of any comments received, a final CED will be prepared, signed by the District Commander, and made available to any stakeholders requesting a copy.

Mitigation for unavoidable impacts to the human and natural environment described in this and other IERs will be addressed in separate mitigation IERs. The CEMVN has partnered with Federal and state resource agencies to form an interagency mitigation team that is working to assess and verify these impacts and to look for potential mitigation sites in the appropriate hydrologic basin. This effort is occurring concurrently with the IER planning process in an effort to complete mitigation work and construct mitigation projects expeditiously. As with the planning process of all other IERs, the public will have the opportunity to give input about the proposed work. These mitigation IERs will, as described in this IER, be available for a 30-day public review and comment period.

## 1.5 PUBLIC CONCERNS

Throughout southern Louisiana, one of the greatest areas of public concern is reducing the risk of hurricane, storm, and flood damage for businesses and residences and providing for public safety during major storm events. Hurricane Katrina forced residents from their homes, temporarily or permanently closed businesses and, due to extensive flooding, made returning to communities in a timely manner unsafe.

In public meetings held 10 January 2009, 3 March 2009, 5 March 2009, and 27 October 2009, several public concerns were raised regarding improved risk reduction on the IHNC.

Public concerns were raised regarding the effect that this project could have on any planned or existing freshwater diversion projects in the vicinity, and both the salinity of the water and the hypoxic area in Lake Pontchartrain. Citizens expressed concerns regarding wetland restoration and environmental impacts, specifically the cumulative impacts of this project and other HSDRRS projects in the area. Residents inquired about the potential human environmental impacts that could be experienced during construction including an increase in noise, damage to transportation infrastructure, damage to homes and businesses from vibration during pile driving and construction equipment operation, and destruction of historical and cultural resources. In addition, residents wanted to know if the new sector gate could be operated manually during a possible complete loss of power, who would be responsible for operation, and whether or not the gate would be left open if there was not an immediate storm threat.

Additional public concerns have been raised regarding potential impacts to navigation from the proposed action. Local citizens and business owners would like for all barges and ships to be evacuated from the protected IHNC area during storm events. The Port of New Orleans and local businesses, specifically those located along the IHNC, have expressed concern regarding impacts to navigation from construction. Specifically, the port and owners are worried about the impacts that could occur to their businesses, including the recreational boating industry, as a result of the possible closure of the IHNC pass through placement of a cofferdam across the IHNC for 6 months to 12 months of the 36-month construction duration. Some businesses rely on the Seabrook pass and the Turning Basin as means of transporting and delivering materials. Any interruption of these areas during construction would impact their ability to function. They requested information on the width of the cofferdam structure, the speed of the currents experienced in the IHNC, and the ability to off-load barges adjacent to the turning basin.

Concerns about flood risk reduction during construction were raised, particularly with regard to the relationship between the project timeline and the closure structures on the GIWW (IER #11 Tier 2 Borgne). Businesses are worried that if the GIWW is closed, there is a possibility that water levels would rise much higher in the IHNC and not only flood businesses within it, but could add additional stress to the existing floodwalls protecting the adjacent neighborhoods. Business owners expressed interest in the construction of a pump in the IHNC to alleviate possible flooding during a storm event from the existing pumps that drain adjacent neighborhoods into the IHNC. They also requested information on the concurrent projects in the IHNC, including the west and east wall modifications. The temporary loss of a lane of France Road would add to the impacts of the closure of the Seabrook access, thus increasing the length of the interruption of business.

The primary concern of IHNC business owners relates to potential impacts to navigation safety. They question the safety of navigating the existing currents at Seabrook and are afraid that these currents could worsen both during and after construction of the proposed action, thereby making navigation by both small craft and barges potentially unsafe. Additional concerns were made regarding flow through the new structures potentially undermining the integrity and/or stability of the existing bridges, specifically the 100-year old, pile-founded Bascule Railroad Bridge.

The U.S. Coast Guard (USCG) commented on the existing hazardous conditions in the mouth of the IHNC during tidal fluctuations. The addition of a cofferdam during construction of the sector gate would increase this danger. Subsequently, the USCG is expected to recommend the IHNC pass at Seabrook be closed to all navigation during the construction period. In addition, the USCG relies on the pass as a route for emergency response, so the construction would necessitate the positioning of a vessel and staff on either side of the IHNC in order to ensure the half hour response time that is required of the USCG. If a sector gate is built, the USCG would have to acquire additional funding to supply these additional resources. The USCG has also requested coordination with the Levee Board as they have a fender system replacement project in progress at Seabrook.

Some are concerned that either closure of the Seabrook structure or currents through the Seabrook structure could negatively impact migration of aquatic species, recreation, and the fishing industry.

## 1.6 DATA GAPS AND UNCERTAINTY

At the time of completion of this report, complete engineering designs and documentation had not been completed for all of the alternatives. This environmental impact analysis is based on preliminary designs and best professional judgment by the technical experts regarding the proposed actions and alternatives. Final engineering details of the proposed action could vary based on the final design. Estimates of materials necessary to construct the project were developed from best professional judgment and preliminary designs reports. The alternative features and associated numbers developed were used to quantify the magnitude of the proposed actions and not to prescribe detailed materials, quantities, or design specifications. Potential impacts on society (people and property and historical and cultural resources) that can be caused by storms and hurricanes create a critical and vital necessity for hurricane and storm damage risk reduction in the Metropolitan Statistical Area; therefore, construction of this HSDRRS project is not being delayed pending future information.

Uncertainty in the final engineering design and construction as well as slight changes to existing conditions in the future could change the impact assessments discussed in this document. For example, access routes to the construction areas are dependent upon many variables that frequently change (weather, traffic conditions, road conditions, construction materials used, fuel prices, etc.). Construction materials would be delivered to the project area, as well as to other ongoing 100-year level of risk reduction projects in the New Orleans Metropolitan Statistical Area. The sources for these materials and the transportation routes for delivering them have not been fully determined. Transportation of materials to construction sites could have localized short-term impacts to transportation corridors. Long-term impacts to road surfaces cannot be fully quantified until the sources of all materials and transportation routes have been fully defined. All applicable new data will be reviewed as it becomes available, and the CEMVN is currently completing a system-wide transportation analysis to better quantify these impacts.

Secondly, an engineering alternatives report is underway for the existing levees and floodwalls on the IHNC and GIWW between Lake Pontchartrain and the MRGO. These studies are intended to determine whether any modifications or remedial actions are necessary to ensure that these levees and floodwalls meet current design criteria and future conditions with a barrier at Seabrook and within the Tier 2 Pontchartrain location range.

New data for design, transportation, and environmental justice (EJ) will be reviewed as they become available. This data and any changes to the assessment provided in this document will be incorporated into future documents (including the draft CED).

Although the project is designed to account for sea level rise over the 50-year life of the project, the impact of sea level rise in conjunction with marsh loss in Southeast Louisiana on the operational scenario is unknown. Because these impacts could result in a change in frequency or duration of gate closure (sea level rise could increase the number of closures per year), adaptive management will be employed to address such changes. Impacts to aquatic resources and fisheries from interactions between subsidence, sea level rise, and the current and future projects proposed in the foreseeable future are also unknown.

Studies done by the USACE indicate that occasionally unfavorable navigational conditions could arise at the GIWW gate within the Borgne Barrier given typical weather and tidal conditions. This refers to an event during "normal conditions" and not classified as a tropical event. A preliminary number for the frequency of these unfavorable conditions was estimated to be in the order of 10 times per year. These unfavorable conditions could be mitigated by closure of the Seabrook gate which is amongst others, an option that is being studied. This reduces the flow through the IHNC basin system and velocities at the GIWW gate. Although the high flow event is estimated to last only 3 hours on average, closure of the Seabrook structure (if mandated) could be done for a full tidal period (~1 day). Other options which are still part of the study are to either allow for passage of barges by means of tripping the barges or ultimately accept navigational delays for these rare events. The action “tripping of barges” refers to a combination of multiple barges pushed by a single tow; a combination of four barges in this case, would navigate the structure in two passages with two barges per passage. Criteria for closing of the Seabrook Gate Complex are still being analyzed and final details will be described in a future Water Control Plan.

Apart from possible closure for adverse flow conditions at the GIWW gate, the Seabrook structure will be closed in a storm event or for maintenance and operation conditions. Once again, exact details on frequency of such events and duration are currently being established. Preliminary estimates presented here give a first indication on the duration and frequency of such closure events. Typically large operation and maintenance works for flood defense structures are carried out once every 10 years. It is assumed that all 3 gates would be closed for approximately a week for maintenance. It should be noted that maintenance of the lift gates happens in the dry and does not require closure. For regular and routine operation and maintenance it is estimated that the structure will be tested every month and only in the cases where there has not been a mandated closure. Such routine testing is expected to take 1 to 2 hours.

Table 1 presents the frequency of tropical events in the New Orleans area. In 79 years, 102 tropical events were observed. From this historical record it is estimated that the frequency of closure for storm surge would be in the order of once per year. A storm event typically lasts in the order of a couple of days. The approximate frequency and duration of the events that would require closure are summarized in table 2.

**Table 1.**
**New Orleans Monthly Storm Occurrences* From 1900-1979**

| Landfall Intensity | May-June | July | August | September | October-November | Total |
|---|---|---|---|---|---|---|
| Hurricane | 2 | 3 | 9 | 21 | 5 | **40** |
| Tropical Storm | 8 | 6 | 7 | 21 | 9 | **51** |
| Tropical Depression | 1 | 3 | 2 | 4 | 1 | **11** |

* All storms passed within 180 nautical miles of New Orleans, Louisiana.
*Source:* http://pubs.usgs.gov/of/2002/of02-206/phy-environment/cyclones1980-99.html.

**Table 2.**
**Approximate Frequency and Duration of Gate Closure Events**

| Event Type | Approximate Frequency | Approximate Duration | Remarks |
|---|---|---|---|
| Routine Operation and maintenance | once a month | ~1 to 2 hours | The entire structure is closed |
| Major maintenance | once per 10 years | ~1 to 2 weeks | The entire structure is closed |
| high flow events | 0-10 times a year | ~1 day | draft numbers, details will be worked out in the Water Control Plan |
| storm surge/storm event | once a year | ~2 to 3 days | draft numbers, details will be worked out in the Water Control Plan |

In order to determine the operating conditions of the Seabrook barrier a study will be performed by USACE in which the ADH model will be run to simulate hydraulic conditions throughout the IHNC system (in its final configuration) for the period of a year. Based upon current velocity exceedance curves the percentage of time that flow thresholds are exceeded would be determined. Equally frequency and duration of adverse flow conditions would be better refined to establish criteria for a Seabrook closure during normal conditions. Closure criteria and system constraints will be documented in the Water Control Plan, which will be finished once the structures go into operation and are turned over to the local sponsor.

Hydraulic modeling from the Engineering Research and Development Center (ERDC) has shown that flow velocity in the GIWW gate could exceed 3 mph (4.4 feet per second [fps]) various times during the year due to wind and tidal effects which would limit navigation due to unfavorable conditions (Martin et al. 2009a). This hydrodynamic analysis has been based on a one year simulation (2006) with the GIWW gate, barge gate, and Bayou Bienvenue gate open, and no restriction at Seabrook. Detailed analysis of the velocity time series for the year 2006 in the opening of the GIWW gate shows that this velocity threshold is exceeded 2 percent of the year (Martin et al. 2009a). Visual inspection of the data set reveals that this 4.4 fps exceedance could happen about 60 times per year. The average time window of this velocity exceedance is about 3 hours (= 2 percent x 365 x 24/60).

Navigation simulations were carried out to test which barge tow configuration could experience navigational problems under different velocity conditions at the GIWW gate (Webb 2009). Most of tow configurations for this area could pass the structure safely. However, for the 2 by 2 loaded barges (configuration of two barges in width and two barges in length; photo 1), some of the pilots did have problems with this configuration under the maximum current conditions, while others did not. Thus, there is chance that a loaded 2 by 2 pack may experience navigation problems through the GIWW gate if the velocity exceeds 4.4 fps. Based on existing tow statistics from 2004 to 2008, the passage frequency in the GIWW of these 2 by 2 loaded barges is 10 per week on average (1.4 per day).

**Photo 1. View of a 2 by 2 pack barge configuration (red outline)**

To assess the impact the joint probability of a simultaneous event of a 2 by 2 pack passage and exceedance of the velocity threshold needs to be considered. The joint probability, which is the chance that multiple events occur at the same time, of having a velocity higher than 4.4 fps in combination with a passage of a 2 by 2 pack equals 0.35 percent every 3 hours during the year (= 2 percent x 1.4 tows per 24 hours/8). Thus, there will be approximately 10 windows of 3 hours per year on average (= 365 x 24/3 x 0.35 percent) when these two independent events (high velocities and passage of a 2 by 2 pack) occur simultaneously.

# 2.0 ALTERNATIVES

## 2.1 ALTERNATIVES DEVELOPMENT AND PRELIMINARY SCREENING CRITERIA

NEPA requires that in analyzing alternatives to a proposed action a Federal agency consider an alternative of “No Action.” Likewise, Section 73 of the WRDA of 1974 (PL 93-251) requires Federal agencies to give consideration to non-structural measures to reduce or prevent flood damage. As part of the Tier 1 IER #11, the no action alternative as well as the non-structural and create wetlands alternatives were evaluated and eliminated from further consideration for the Tier 2 Pontchartrain project area because none accomplished the purpose and need of the project.

The no action alternative was evaluated in detail in the Tier 1 document. Because this alternative did not meet the defined purpose and need in the Tier 1 document, it was not selected for further consideration in this Tier 2 document. Likewise, although non-structural measures are widely recognized as reasonable complementary measures to other HSDRRS measures, they were eliminated from further analysis in the Tier 1 document because they would not meet the needs of the project as a stand-alone alternative for providing the 100-year level of risk reduction. Additionally, the wetlands creation alternative was not considered an effective engineering solution in providing 100-year hurricane risk reduction as a stand-alone alternative.

A range of reasonable alternatives for this Tier 2 document was formulated through input by the CEMVN Project Delivery Team (PDT), Value Engineering Team, engineering and design consultants, as well as local government, the public, and resource agencies to achieve the purpose and need of this project. Once a full range of alternatives was established, a preliminary screening was conducted by the CEMVN to identify alternatives that would proceed through further analysis. The criteria used to make this determination included engineering effectiveness, risk reduction, navigation safety, economic efficiency, and environmental and social acceptability. Those alternatives that did not adequately meet these criteria were considered infeasible and, therefore, were eliminated from further study in this IER.

## 2.2 DESCRIPTION OF THE ALTERNATIVES

Regardless of the alignment, each alternative would include the following common features, discussed in detail here: T-wall floodwalls, a sector gate, and two flow augmentation gates (vertical lift gates). T-wall floodwall sections (tie-ins between the floodgates and the existing HSDRRS) would be built to a construction grade elevation of +16.0 feet (ft) North American Vertical Datum 1988 (NAVD88). A sector gate would be built with a top of gate elevation of approximately + 16.0 ft to +18.0 ft NAVD88 and a sill elevation no deeper than -20.0 ft NAVD88. This sector gate would have a 95-ft wide navigation opening, which is the width of the existing navigational channel and concrete dolphins.

The two non-navigable vertical lift gates would be installed on either side of and adjacent to the sector gate. These vertical lift gates would be necessary to maintain existing flow velocities through the sector gate since higher velocities would make navigation through the sector gate difficult (and potentially unsafe) and also cause problems for fish migrating through the gate. The lift gates would be strictly auxiliary structures; navigation through these gates would be prohibited. Each lift gate would have a width of no greater than 60 ft and sill elevations no deeper than -20.0 ft NAVD88. The tops of the lift gates would be flush with the adjacent sector gate.

Five potential alternatives were carried forward after initial screening and are shown in figure 2.

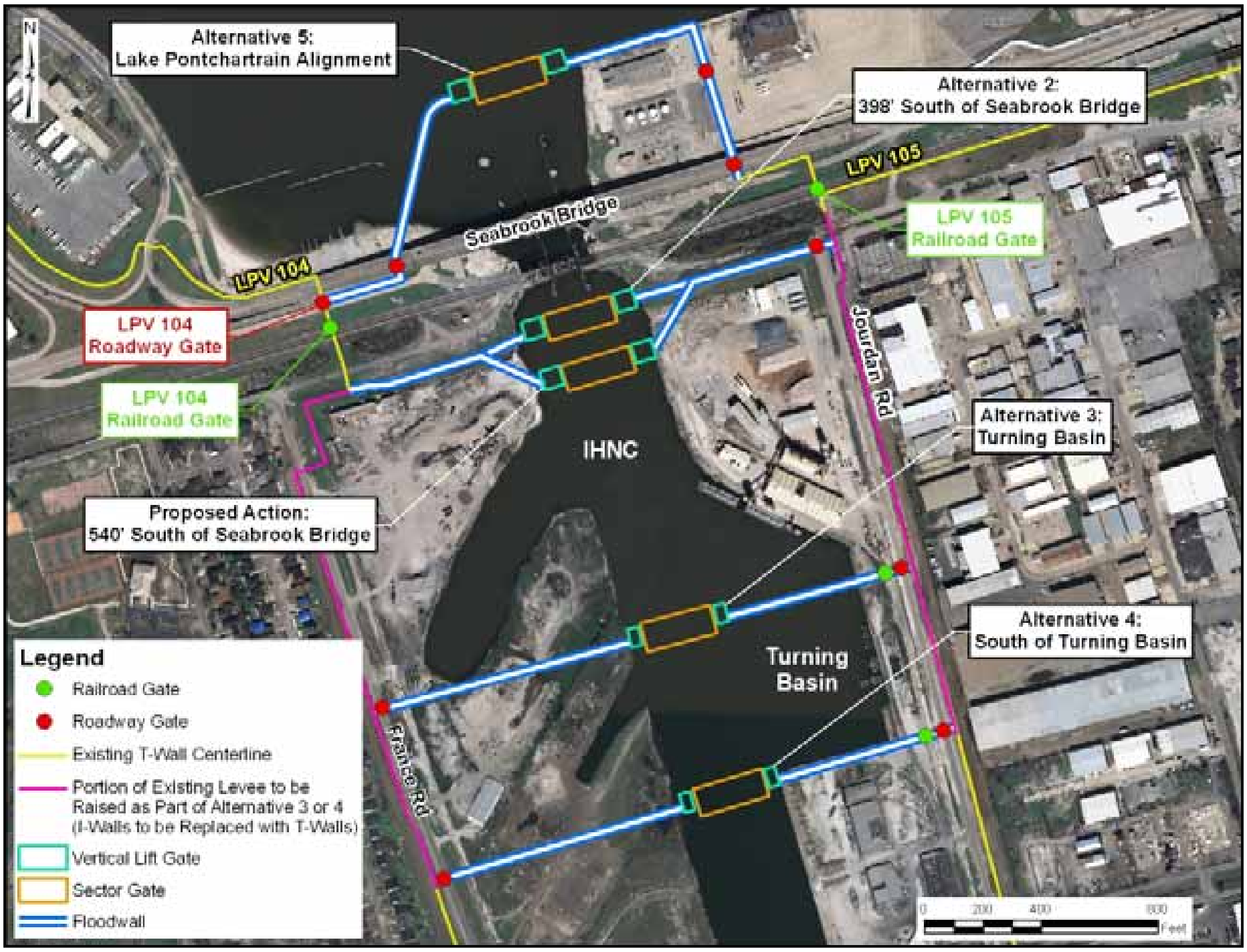



**Figure 2. IER #11 Tier 2 Pontchartrain Alternative Alignments**

## 2.3 PROPOSED ACTION

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

The proposed action consists of a sector gate (figure 3) and two vertical lift gates (figures 3 and 4) in the IHNC 540 ft south of the Senator Ted Hickey Bridge (henceforth referred to as Seabrook Bridge) and the Bascule Railroad Bridge with T-wall floodwall tie-ins to LPV 104 to the west and LPV 105 to the east. This alternative would also include a 20 ft-wide vehicle gate in the eastern floodwall to provide access to Jourdan Road.

A USACE technical review of the Seabrook closure system indicated that a combination of gate types would allow flow to pass through with velocities that allow safe navigation through the Seabrook structure (USACE 2009a). These additional gates are necessary to meet the design goal of meeting or improving historical velocity conditions through the Seabrook pass. The two types of gates that would be utilized for the Tier 2 Pontchartrain project are sector gates and vertical lift gates. The navigable sector gate would be designed in a traditional configuration (see figure 3). It would consist of two steel, prefabricated gates that swing from abutments on both sides of the channel opening. Guide walls would be provided to facilitate the movement of vessels through the sector gate opening, which would be aligned with the Seabrook Bridge and the railroad navigation openings. The sector gate structure itself would be housed within a concrete monolith. During regular channel traffic conditions (gate open) the sector gate leaves would each rest within the recess in the gate bay walls on either side of the channel. Final design would include features such as ramps and baffles to minimize impacts to fish migration through the gate.

During construction, a temporary braced cofferdam would be installed across the channel around the approximate perimeter of the sector and vertical lift gates for a period of approximately 6 months to 12 months (figure 3). This portion of the channel would likely be closed to navigation and recreational vessels for the duration of the construction of the sector gate and vertical lift gates; however, ingress and egress to and from the Seabrook area of the IHNC via the GIWW would remain available. The construction schedule may include work up to 24 hours per day and 7 days per week. The USACE carefully reviewed the option to provide a navigable 'bypass' through the cofferdam structure, but determined that regardless of the construction sequence, a bypass would be infeasible due to the potential for high flow rates, which raised public safety concerns associated with navigating directly through an active construction area in a high current situation. Additionally, the construction sequence necessary to provide such bypass could potentially add approximately 8 months to the construction schedule, and would result in a substantial cost increase.

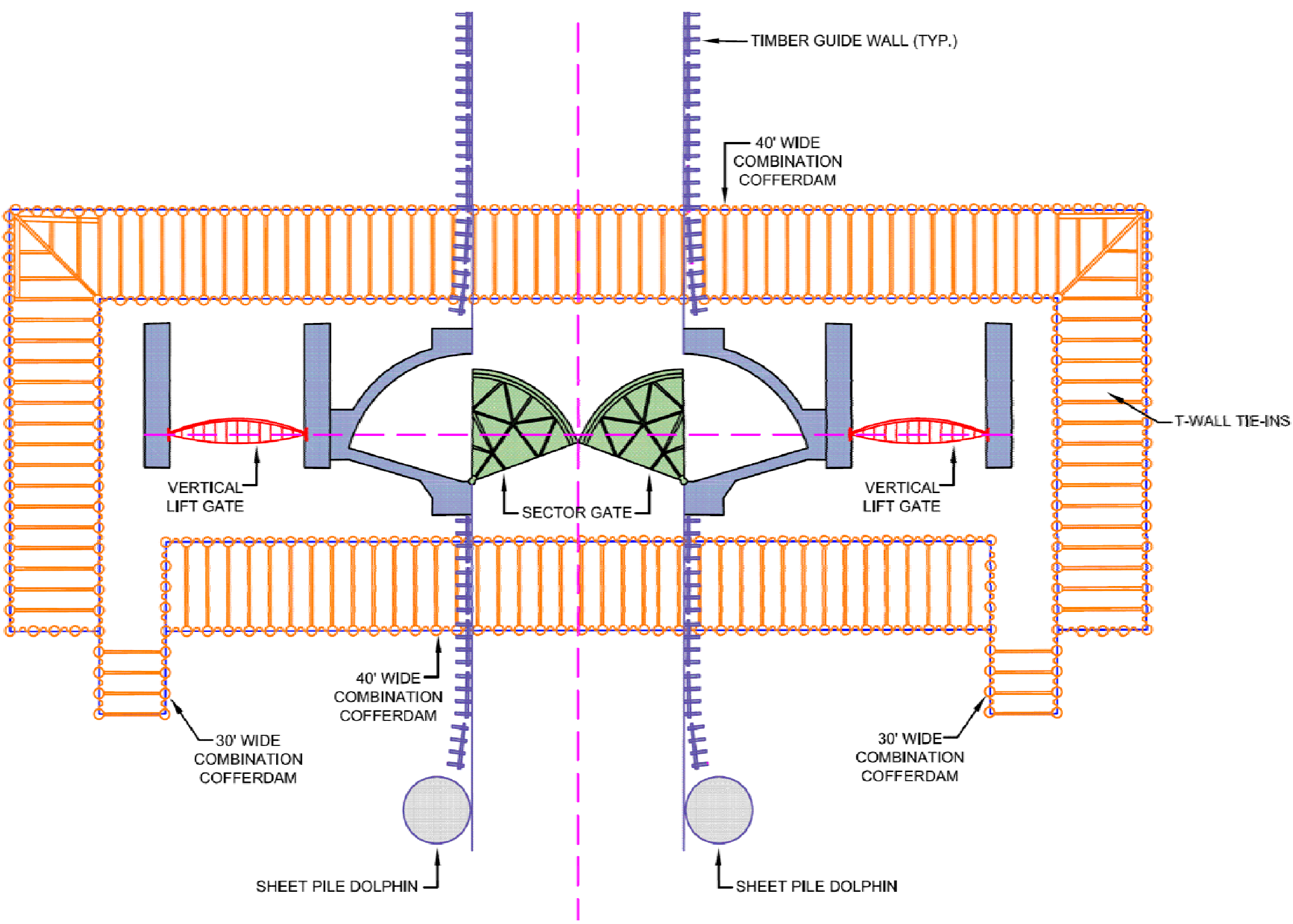



**Figure 3. Diagram of Floodgates and Temporary Cofferdam**

With the cofferdam in place, a tremie seal (concrete placed underwater using a tremie) would be placed around the piles to the approximate bottom of the sector gate structure base slab to counteract the hydrostatic uplift force once the cofferdam is dewatered. The base slab of the sector gate structure would rest on hollow steel pipe piles, a sheet pile wall, and the thick tremie seal.

The non-navigable vertical lift gates for all alternatives would consist of two concrete pilasters that support a concrete or steel bridge that spans the channel and provides maintenance access and structural support for the vertical floodgates (figure 4). Coast Guard approved warning devices will be installed to direct navigation away from the lift gates as the difference between the height of the lift gates in the open position and the typical water elevations in the IHNC will not provide sufficient clearance for boats or barges to pass thru the gates. Electric motors would be required to operate the vertical lift gates. The purpose of these gates would be to allow enough of an open area for flow through the risk reduction structure to maintain existing velocities in the Seabrook area.

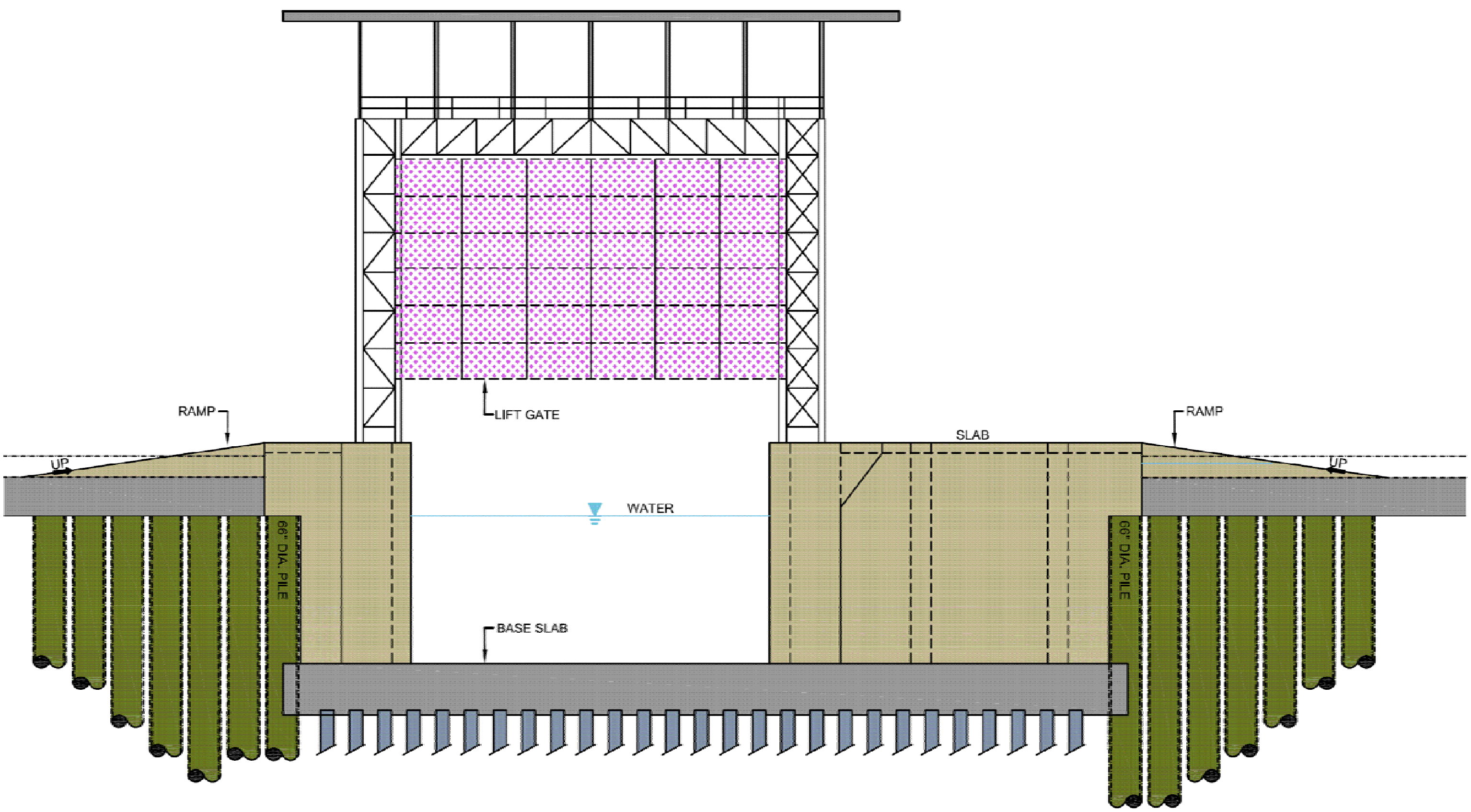



**Figure 4. Example of a Non-Navigable Vertical Lift Gate**

A site plan of the proposed action is shown in figure 5. In order to design and construct the proposed action, the total area that may be required for structure right-of-way (ROW), construction access, staging areas, and office trailer locations is estimated to be 26 acres (figure 6). This total area would include approximately 14 acres for permanent easements (i.e., floodwall/floodgate ROW, perpetual access easement, etc.) and 12 acres for temporary construction easements. A portion of the temporary staging area could be converted to permanent staging by the non-Federal sponsor upon project completion.

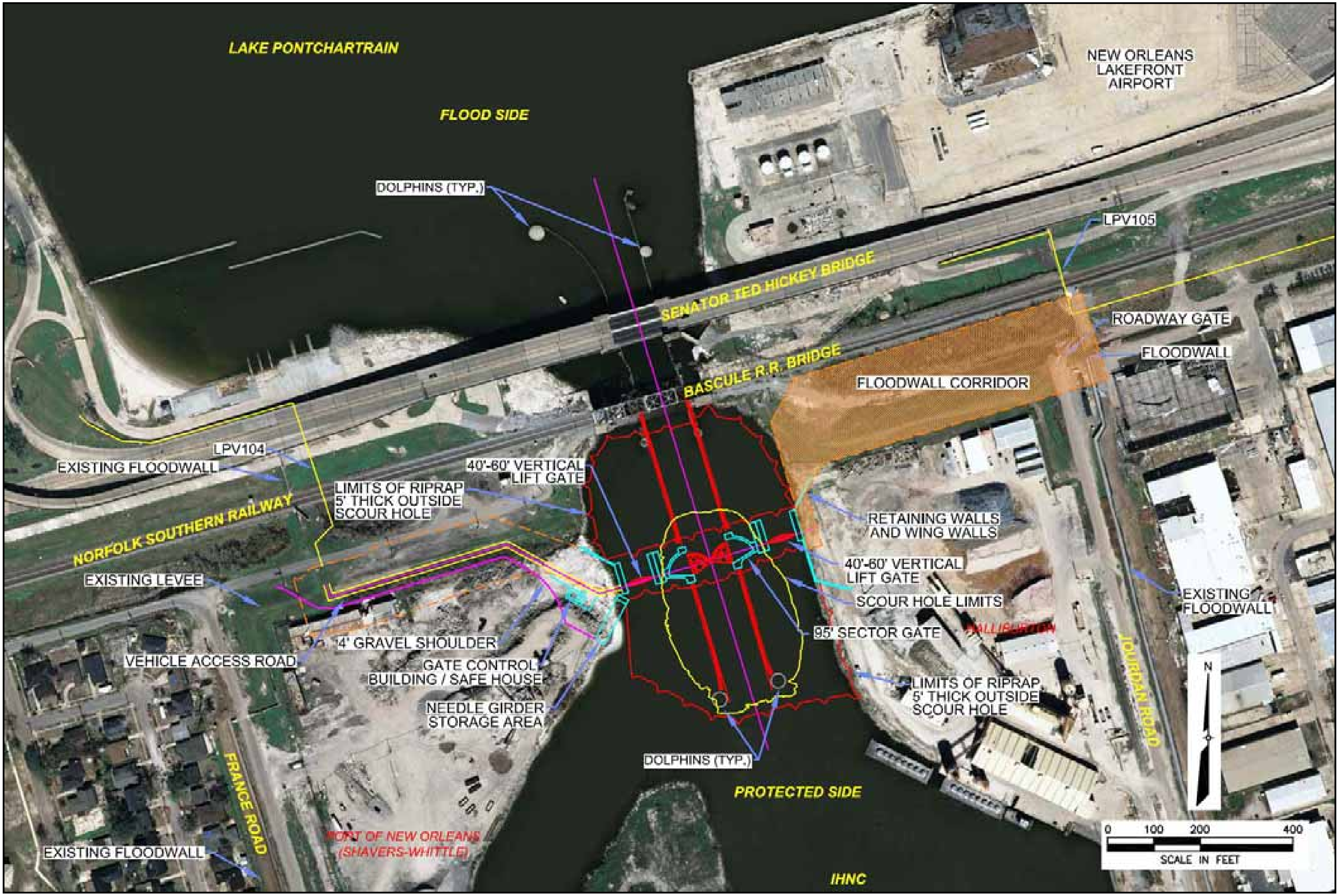



**Figure 5. Diagram of Proposed Action - Bridgeside Alignment 540 ft South of Seabrook Bridge**


**Figure 6. Permanent and Temporary Easements for the Proposed Action**

Two scour holes, most likely the result of extreme storm event tidal flow into and out of the lake, are located approximately 300 ft to the north and 300 ft to the south of the Seabrook Bridge (distance from bridge to nearest edge of each hole) within the IER #11 Tier 2 Pontchartrain project area (figure 7). The north scour hole is approximately 300 ft wide, 525 ft long, and 100 ft deep, and the south scour hole is approximately 275 ft wide, 450 ft long, and 90 ft deep.

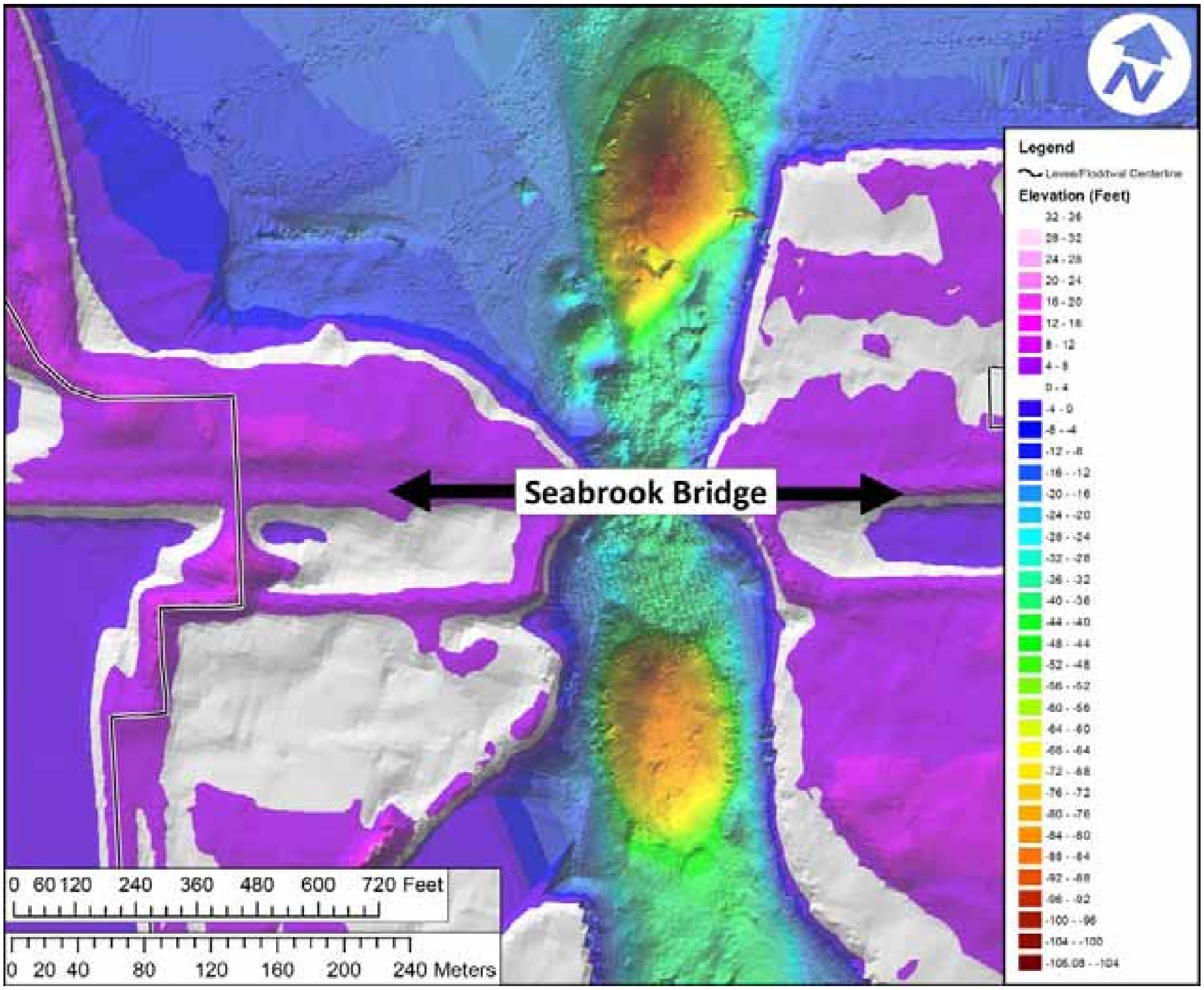



**Figure 7. Locations and Depths of Scour Holes near the Project Area**

Since the proposed action would encroach into the south scour hole, this alignment would require filling the existing scour hole before construction of the cofferdam and foundation could begin. The scour hole would be filled in to provide lateral support for the pilings. The lower portion of the scour hole would be filled with coarse sand to El -42.0 ft NAVD88 before the guide wall and supporting piling are driven; then, stone riprap would be placed around the support piling to El -37.0 ft NAVD88. The IHNC in the project vicinity ranges from approximately -30 ft to -41 ft in depth outside the scour hole.

Approximately 1,500 ft of T-walls would be required under the proposed action (figure 8). T-wall floodwall tie-in sections would connect the gate structures in the IHNC to the T-walls built on existing levees on either bank of the IHNC. The exact alignment of the east bank T-wall built on existing levees has not yet been determined; however, the floodwall would be constructed within the 'floodwall corridor' shown on figure 5 and would have a similar final footprint as the floodwall on the west bank.

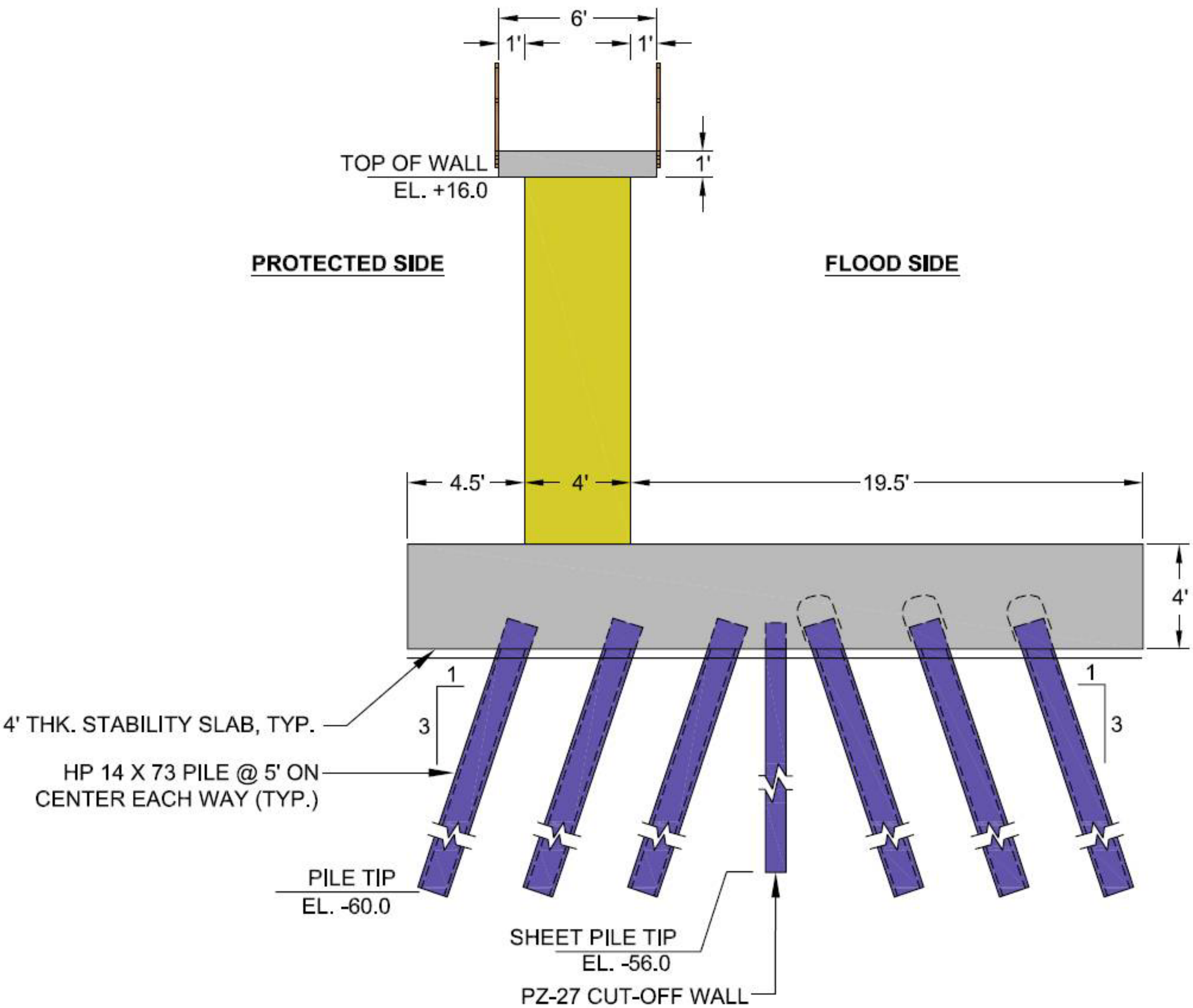



**Figure 8. Typical T-Wall Floodwall Cross-section**

Steel sheetpiles would connect the adjacent gates to the banks and provide confinement for placement of sand and riprap to create new levee sections to approximately El +4.0 ft NAVD88. These sheetpiles would be used as retaining walls to contain the soil backfill and protect the gate structures themselves from any type of sliding of the soil backfill. T-wall tie-ins would be placed on the backfill and founded on sheetpiles. The 19.5-ft wide toe of the tie-in would provide for vehicular access to the outer side of either vertical lift gate structure (figure 8).

T-walls on top of the existing levees that run parallel to the Seabrook Bridge would be built over a sheetpile cutoff wall to El -56.0 ft NAVD88 to prevent seepage. Figure 9 illustrates a cross-section of a T-wall floodwall built on an existing levee. The T-walls would be placed on the existing levees and would transition laterally to LPV 104 and LPV 105 at El +16.0 ft NAVD88. The 15-ft-wide toe of the wall would provide vehicular access to the outer side of either vertical lift gate structure. The floodwall on the east side of the channel would include a 20-ft-wide vehicle flood gate with a sill at existing ground elevation to provide access to Jourdan Road. A 12-ft-wide asphalt access road would run from the control building along the south toe of the slope to France Road.

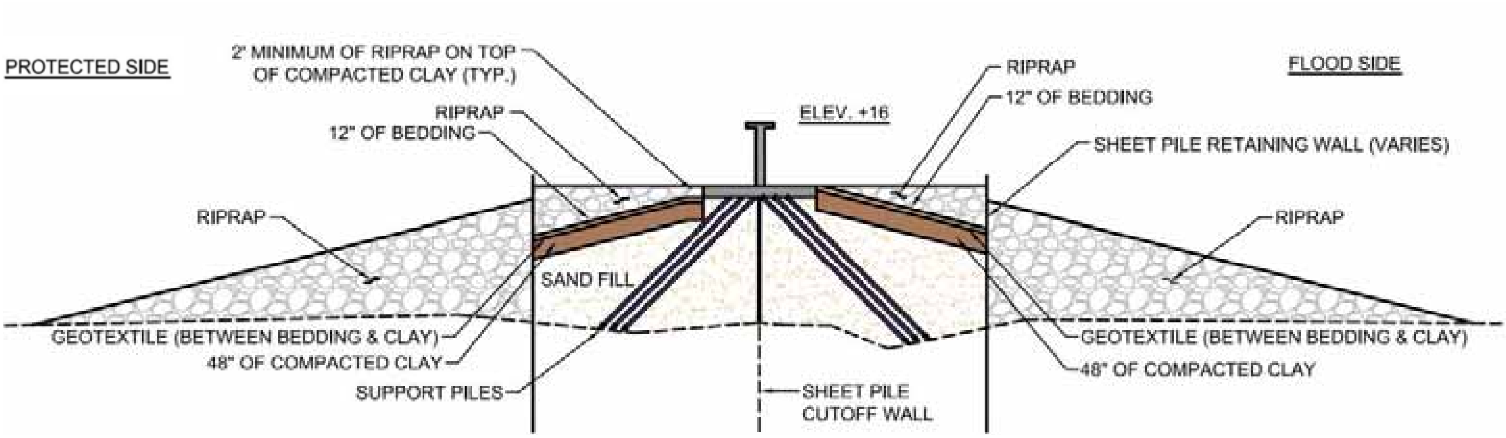



**Figure 9. Cross-section of a T-Wall built on an Existing Levee (Proposed Action and Alternative #2)**

To prevent the forming of new scour holes or eroding the banks of the IHNC, scour protection and riprap bank protection would be placed over the approximate area shown in figure 5. In addition, the sill would be sloped to direct water flow through the center of the channel and a training wall would be constructed to further reduce bank erosion.

A control building would be constructed to house a safe room area, standby generators, power distribution, and programmable logic controller (PLC) communications/monitoring system for the gates. This hurricane-proof structure would have an estimated 15-ft by 30-ft footprint and would be located on the protected side, to the west of the western vertical lift gate structure near the east end of the west bank floodwall (figure 5). The control building would be accessible by a vehicle access drive for refueling, operation, and maintenance purposes.

The proposed sector gate and two vertical lift gates would remain open except during extreme storm events, high flow events, and routine maintenance. Specific conditions (i.e., high velocities through the navigable gate on the GIWW) could arise that would require the Seabrook floodgates to be closed at times other than during a storm event. Analysis of historical wind, tide, and velocity data suggests that these closures could be required up to approximately 10 times a year to help control/reduce velocities through the gates on the GIWW. However, the operational scenario will be determined at a later date in cooperation with the local sponsor, as described in section 1.6. A simulated rendering of the proposed action alignment in both the open (normal operating conditions) and closed (during a storm event) positions is illustrated in figure 10.

**Figure 10. Simulated Image of Proposed Action Alignment in the Open and Closed Positions**
(During storm conditions when gates are closed, water level will be higher on the floodside of gates)

### *Armoring of Levees and Floodwalls*

Armoring could be incorporated as an additional feature to protect against erosion and scour on the protected, flood, or both sides of critical portions of levees and floodwalls. These critical areas include: transition points (where levees and floodwalls transition into any hardened feature such as floodwalls, pump stations, etc.), utility pipeline crossings, floodwall-protected side slopes, and earthen levees that are exposed to wave and surge overtopping during a 500-year storm event. The proposed method of armoring could be one of the following: cast-in-place reinforced concrete slabs; articulated concrete blocks (ACB) covered with soil and grass; turf reinforcement mattress (TRM); ACB/TRM; TRM/grass; or good grass cover. The armoring would be incorporated into the existing levee or floodwall footprint and no additional environmental impacts would be anticipated.

### *Construction-Related Information for Proposed Action*

Phase 1 of the construction would consist of two concurrent components, Phase 1a and Phase 1b. Phase 1a would focus on the construction of the portion of the structure below water and fabrication of the gates. This would include filling the scour hole, driving guide wall piling, driving foundation piling and cutoff wall piling, constructing the braced cofferdam, constructing the tremie concrete seal and sill slab, constructing the lower portion of the gate bays to an elevation above normal water height, and constructing the guide walls.

Phase 1b, which could proceed concurrently with Phase 1a, would include the relocation of roads, utilities, and other facilities; and installation of access roads and fencing and construction of the T-wall floodwalls.

Phase 2 of the construction would include completion of the gate bays, head walls, and wing walls; installation of gates using stop logs and dewatering the bays; completion of tie-in floodwalls; construction of the gate control building with safe room; installation of operating equipment; construction of guide walls; construction of riprap stability measures; construction of riprap erosion measures; installation of upstream and downstream scour protection; completion of site development and surfacing of service roads; installation of electrical supply lines; completion of all electrical and mechanical work; testing the operation of the gates; preparing the operation manual; and training the operation staff.

Borrow material for the project reaches within the IHNC channel, including sand fill for filling the scour hole, would come from a government-approved source. The sand fill would be protected by layers of graded stone riprap and topped with a layer of cover stone. This material would be stock piled, as needed, along the protected-side of the new proposed action alignment. Concrete would likely be transported to the site via ready mix concrete trucks and pumped on-site. Steel sheet piling and H-piling would likely be shipped by rail or by barge into the city from the manufacturer. Surfacing would likely be provided by a local supplier and transported via truck to the project site.

Construction activities would be expected to last for approximately 36 months. It is possible that construction of the floodwalls for the proposed action could not be accomplished concurrently with construction of the floodgates in the IHNC due to logistical issues such as accessibility, man power, and material staging and delivery. A significant amount of construction equipment would be required to conduct the work, including bulldozers, hydraulic cranes, mechanical cranes, hydraulic excavators, welders, concrete pump trucks, rollers, pile hammers, graders, tractors, front-end loaders, flatbed trucks, and pickup trucks.

Table 3 provides information on the approximate volumes of materials that would be required for construction of the proposed action.

**Table 3.**
**Estimated Construction Material Quantities Required to Complete the Proposed Action***

| Major Classification | Specific Sub Item | Units of Measure | Quantity |
|---|---|---|---|
| **Concrete** | Tremie Seal | cubic yards (cy) | 20,273 |
| | Grout | cy | 292 |
| | 2,500 PSI Concrete | cy | 318 |
| | 4,000 to 5,000 PSI Concrete | cy | 33,922 |
| **Structural steel** | Walers and Struts | tons | 776.8 |
| | Grade 50 Structural Steel | tons | 599 |
| | Hand Rail | linear feet (LF) | 1,308 |
| **Sheet piles** | PZ 22 | square feet (sq ft) | 243,720 |
| | PZ 27 | sq ft | 528,960 |
| | PS 27.5 | sq ft | 18,086 |
| **H-piles** | HP 14x89 | vertical linear feet | 14,976 |
| | HP 14x73 | vertical linear feet | 51,025 |
| **Steel Pipe Piles** | 54” Steel Pipe Pile | vertical linear feet | 28,500 |
| | 24” Steel Pipe Pile | vertical linear feet | 37,278 |
| **Sand** | Sand fill | cy | 184,322 |
| **Asphalt, Riprap & Aggregate** | Asphalt | square yards | 1,067 |
| | Riprap - Type I | tons | 10,340 |
| | Riprap - unclassified | tons | 75,314 |
| | Aggregate Base Course | cy | 1,067 |
| | 1” Riprap Bedding Stone | square yards | 8,837 |
| **Embankment Material** | Clay | cy | 18,409 |

* *Includes materials estimated for partially filling the scour hole.*

## 2.4 ALTERNATIVES TO THE PROPOSED ACTION

Four alternatives to the proposed action were considered in detail; three in-channel alternatives south of the bridge, and one alternative north of the bridge within Lake Pontchartrain. For each alternative, all T-walls would be built to an elevation of +16.0 ft NAVD88 and the dimensions and combination of floodgate structures (a sector gate and two vertical lift gates, illustrated in figures 3 and 4) would be the same as described for the proposed action.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

Alternative #2 is similar to the proposed action except the gates would be aligned across the IHNC approximately 150 ft closer to the Seabrook Bridge and all features would be in line with one another (figures 2 and 11). Approximately 1,300 ft of T-walls would be constructed to transition the floodgate structures laterally to LPV 104 and LPV 105 at El +16.0 ft NAVD88. Similar to the proposed action, a 20-ft wide vehicle swing gate would be required along the eastern floodwall to provide access to Jourdan Road.

Construction activities for alternative #2 would be expected to last for approximately 36 months. During construction, a temporary braced cofferdam would be installed across the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. This portion of the channel could be closed to navigation and recreational vessels for the duration of the construction of the sector gate and vertical lift gates. The construction schedule may include work up to 24 hours per day and 7 days per week.

Under this alternative, the lower portion of the scour hole would be partially filled with sand to El -60.0 ft NAVD88 before the guide wall and supporting piling are driven; then, stone riprap would be placed around the support piling to El -30.0 ft NAVD88.

The total area that may be required for ROW, construction access, construction easements, storage areas, and office trailer locations for this alternative is estimated to be 27 acres. This total area is comprised of approximately 12 acres for permanent easements (i.e., floodwall/floodgate ROW, perpetual access easement, etc.) and 15 acres for temporary construction easements.

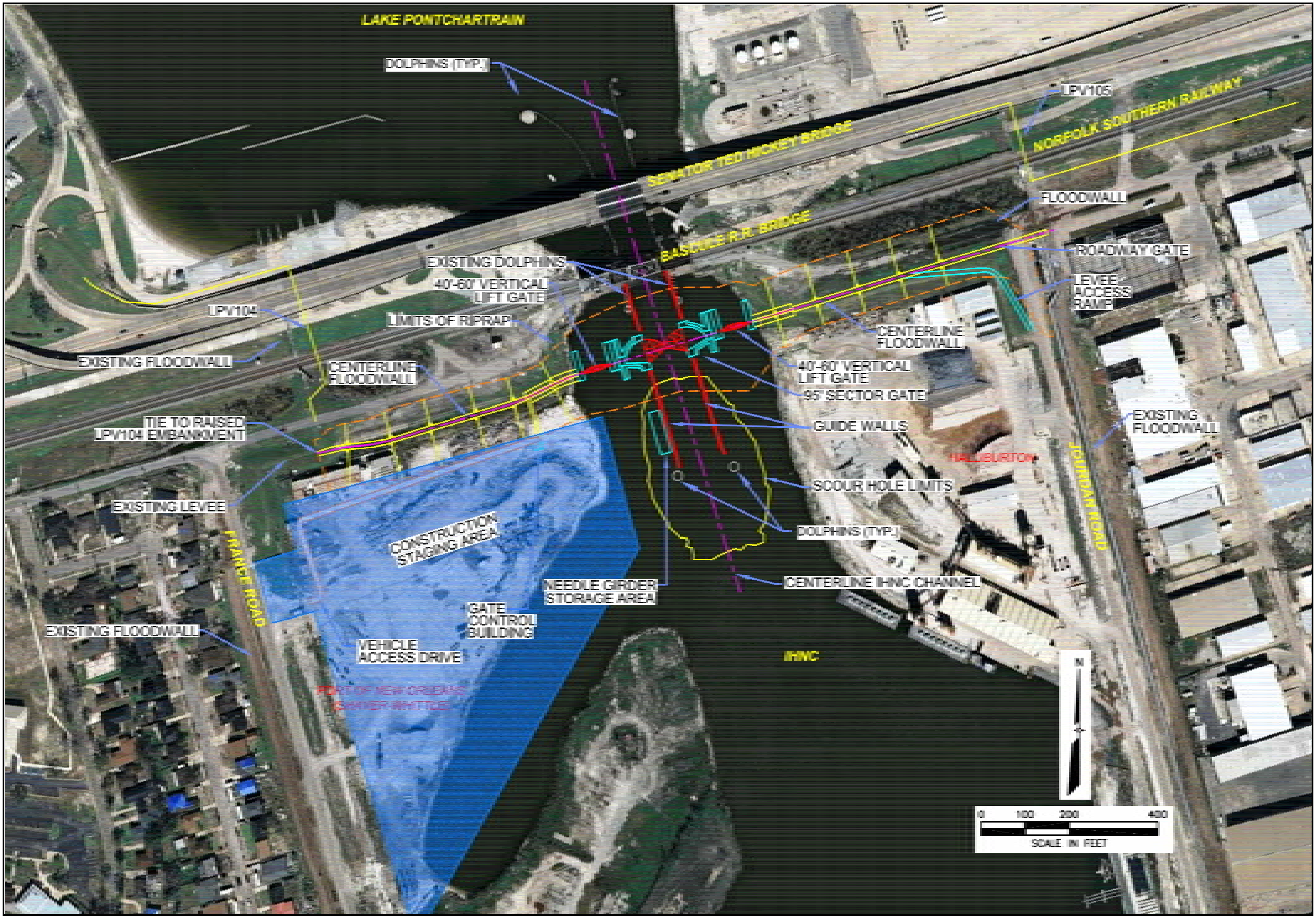



**Figure 11. Diagram of Alternative #2 - Bridgeside Alignment 398 ft south of Seabrook Bridge**

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

Alternative #3 includes similar features to the proposed action; however, the gate structures would be aligned across the IHNC 960 ft farther to the south of the Seabrook Bridge, requiring that the floodwalls, which comprise the east side of the alignment run across the IHNC Turning Basin. This alignment would also include 20-ft wide vehicle swing gates in the western and eastern floodwalls to provide access to France Road and Jourdan Road, respectively. An 18-ft wide railroad swing gate would also be included in the eastern floodwall for the existing railway.

Under this alternative, approximately 1,500 ft of T-walls would tie-in the floodgates to the existing HSDRRS on the eastern and western banks of the IHNC by transitioning laterally to LPV 104 and LPV 105 at El +16.0 ft. Additionally, the existing I-walls along the existing western and eastern sides of the IHNC would be replaced with T-walls as part of this raising process. A site plan of alternative #3 is shown in figure 12.

Unlike the proposed action, no scour holes are known to be present near the alternative #3 alignment; therefore filling the scour hole would not be included in the construction. However, during construction a temporary braced cofferdam would be installed in the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. Construction activities for alternative #3 would be expected to last for approximately 39 months and the construction schedule may include work up to 24 hours per day and 7 days per week. Sufficient space may be available around the temporary cofferdam structure for passage of canal traffic until the gate opening is placed in service, thus allowing for continuous navigation. However, it is likely that out of concern for safety, the IHNC may be closed to all navigation while the cofferdam is in place.

The total area that may be required for ROW, construction access, staging areas, and office trailer locations for this alternative is estimated to be 37 acres. This total area is comprised of approximately 18 acres for permanent easements, 12 acres for temporary easements, and 7 acres for ROW associated with replacing the existing I-walls along the IHNC with T-walls. This alternative crosses twice the amount of water as the proposed action and alternatives #2 and #4.

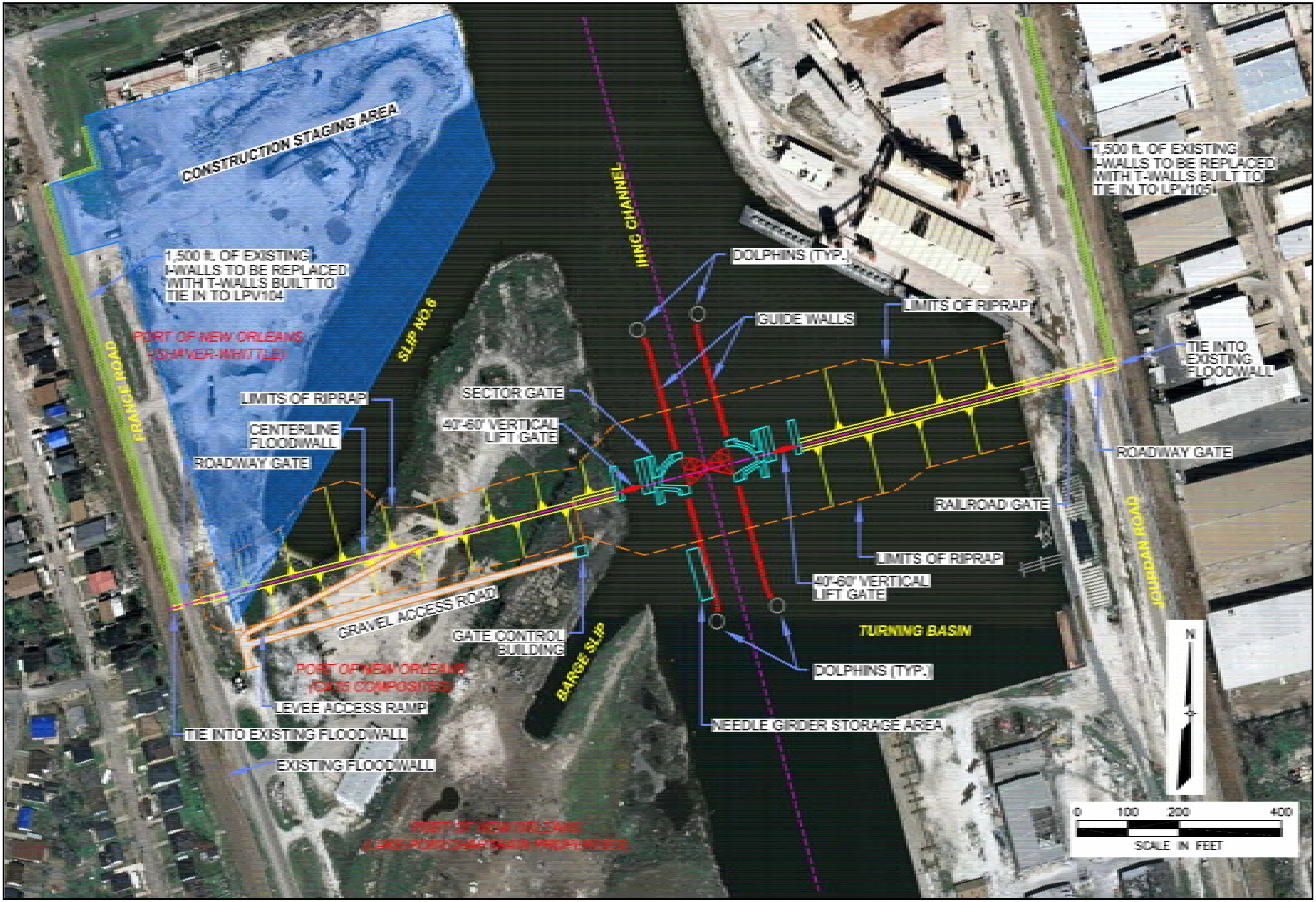



**Figure 12. Diagram of Alternative #3 – Turning Basin Alignment**

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

Alternative #4 includes similar features to the proposed action, but is the southernmost alignment. The sector and lift gates would be aligned across the IHNC 2,000 ft south of the Seabrook Bridge, immediately south of the IHNC Turning Basin. This alignment would also include 20-ft wide vehicle swing gates in the western and eastern floodwalls to provide access to France Road and Jourdan Road, respectively. An 18 ft wide railroad swing gate would also be included in the eastern floodwall for the existing railway.

Approximately 1,450 ft of T-walls would tie-in the floodgates to the existing HSDRRS on the eastern and western banks of the IHNC by transitioning laterally to LPV 104 and LPV 105 at El +16.0 ft. Additionally, the existing I-walls along the western and eastern sides of the IHNC would be replaced with T-walls as part of this raising process. A site plan of alternative #4 is shown in figure 13.

Unlike the proposed action, no scour holes are present near the alternative #4 alignment; therefore, filling the scour hole would not be included in the construction. However, for this alternative a temporary braced cofferdam would be installed in the channel around the approximate perimeter of the sector gate and vertical lift gates. This portion of the channel could be closed to navigation and recreational vessels for the duration of the construction of the sector gate and vertical lift gates, which is anticipated to last approximately 6 months to 12 months. The construction schedule may include work up to 24 hours per day and 7 days per week. The construction duration for alternative #4 would be approximately 40 months.

The total area that may be required for ROW, construction access, staging areas, and office trailer locations for this alternative is estimated to be 36 acres. This total area is comprised of approximately 15 acres for permanent easements, 12 acres for temporary easements, and 9 acres for ROW associated with replacing the existing I-walls along the IHNC with T-walls. This alternative would utilize the same 12-acre staging area (blue shaded area on figures 6, 11, and 12) as the proposed action and all other alternatives.

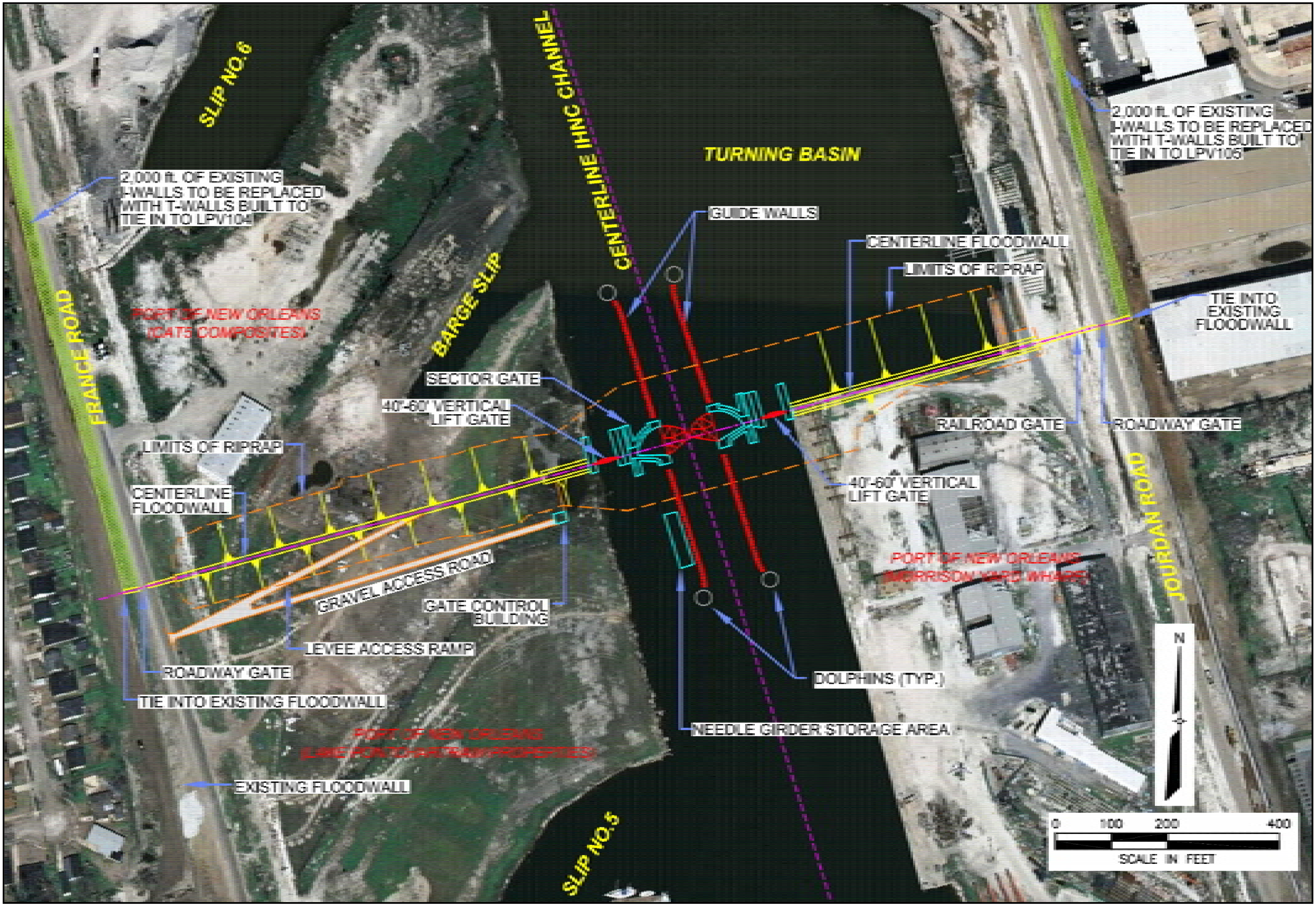



**Figure 13. Diagram of Alternative #4 – South of Turning Basin Alignment**

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

Alternative #5, the northern-most alignment, is the only alternative located within Lake Pontchartrain. The sector and lift gates would be built in Lake Pontchartrain 502 ft north of the Seabrook Bridge, aligned on the eastern bank with the edge of the New Orleans Lakefront Airport property. Approximately 1,800 ft of T-walls would transition laterally to LPV 104 and LPV 105 at El +16.0 ft. This alignment would also include a 20-ft wide vehicle swing gate along the eastern floodwall to provide access to the airport's jet fuel storage area and two vehicle swing gates would be built across access roads that run under the Seabrook Bridge.

Alternative #5 would span the deepest portion of the north scour hole in Lake Pontchartrain, north of the Seabrook Bridge. The lower portion of the scour hole would be partially filled with sand before the guide wall and supporting piling are driven; then, stone riprap would be placed around the support piling. A site plan of alternative #5 is shown in figure 14.

Alternative #5 would cause the least amount of disruption to navigation of all alternatives considered. Construction in the lake would permit staged construction, which would allow limited navigation during construction, but would also extend the construction duration (approximately 45 months). The construction schedule may include work up to 24 hours per day and 7 days per week.

The total area that may be required for ROW, construction access, staging areas, and office trailer locations for this alternative is estimated to be 34 acres. This total area is comprised of approximately 12 acres for permanent easements and 21 acres for temporary easements. Alternative #5 would utilize the same 12-acre staging area (blue shaded area on figures 6, 11, and 12) as the proposed action and all other alternatives.

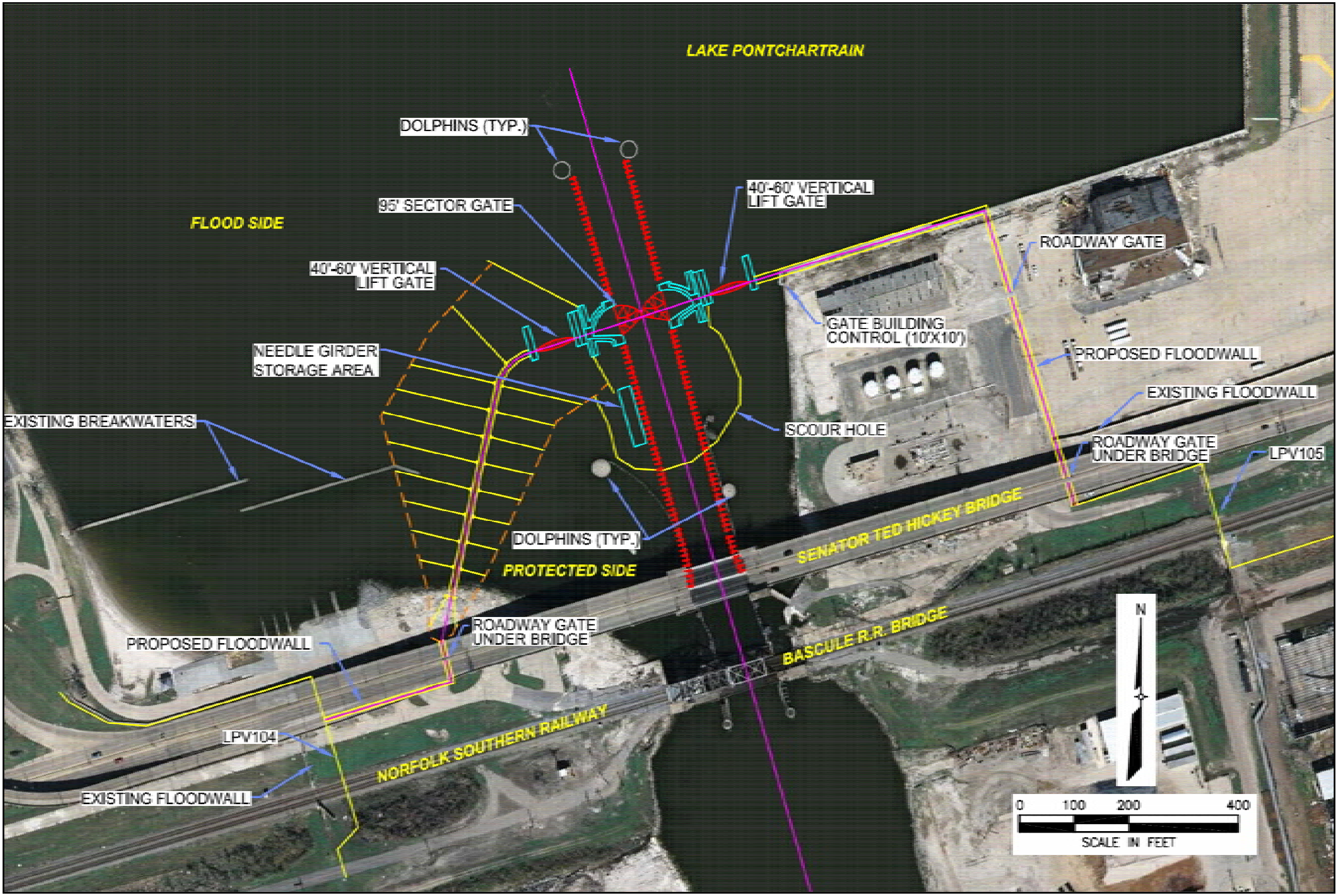



**Figure 14. Diagram of Alternative #5 - Lake Pontchartrain Alignment**

## 2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

In addition to the alternatives already eliminated from further consideration as part of the Tier 1 IER #11 document, two additional alternatives and one feature were eliminated from further consideration because they did not adequately meet the screening criteria under the Tier 2 evaluation.

***Alternative #3a: Just North of Slip No. 5 Alignment - Sector Gate approximately 2,500 ft south of Seabrook Bridge and T-wall***

This alignment would be similar to the proposed action except for the location of the alignment across the IHNC. This alternative would be built approximately 320 ft south of alternative #4, just north of Slip No. 5. The west side of this alignment would tie-in to the existing floodwall, run east across France Road and across the recreational vehicle (RV) park property and into the IHNC. The east side of the alignment would run through the Morrison Yard Wharf dock board, through the entrance gate to the Morrison Property, and tie-in to the existing floodwall east of Jourdan Road.

On the western side of this alignment, the Pontchartrain Landing, New Orleans Waterfront Park lies between the Barge Slip and Slip No. 5 of the IHNC. Within the park, there is a central operation building (pavilion) for the park with outside decking, landscaping, and a pool. Behind the pavilion, there is a detention pond with a fountain in the center. The RV park itself includes 122 full-service sites with water, electric and cable hookups; 33 of these sites are waterfront sites. There are also numerous dolphins lining the water's edge in the IHNC and the slips in various conditions of repair. Sanitary sewer and water lines run parallel to France Road between the road and the RV park.

On the eastern side of this alignment, railroad tracks run parallel to Jourdan Road. Additionally, there are railroad tracks within the Morrison Yard Wharf property that once provided rail access to the docked barges. A security fence borders the Halliburton Property along Jourdan Road. Raised electric lines and elevated hydrants (water lines) run between the security fence and the railroad tracks. Inside the security fence there are railroad tracks that run parallel to the road and the fence. Water lines and electric lines run throughout the area between the road and the dock board. The dock board has open areas where the concrete is broken and the rebar is exposed. The buildings in this area have been abandoned, post Hurricane Katrina. There are miscellaneous pieces of equipment, steel, tires, and general large debris across the site.

This alignment was not considered a discrete alternative that offered any engineering advantages over other similar alternatives. Based on the utility locations, the condition of the dock board, and the property conflict for the RV park, this alignment was considered not to offer any additional benefits not already found in the other alternatives, but would have additional negative impacts on the human environment.

***Lock Alternative: Navigation Lock Structure Placed in Any of the Alternative Alignments***

In lieu of a traditional gate structure, the use of a navigation lock in any of the five alignments was included in the initial alternatives evaluation. For the evaluation process, construction of the lock along the alternative #2 alignment was examined, with an understanding that the lock option could be transposed to other alignments to determine the best location. The 200-ft long and 84-ft wide lock structure with a sill elevation of -16.0 ft National Geodetic Vertical Datum of 1929 (NGVD29) would be patterned after a lock that was originally designed for this location in the 1970s (USACE 1970). The gates in the lock structure would be sector gates. Culverts could be provided to allow for movement of fish and other aquatic species during periods when the gates are closed. The lock would require full-time operation for control of velocities and for passage of water craft. Operation would involve keeping one lock gate closed to stop canal flow until the water craft is inside the lock chamber, then closing the second gate and opening the first gate to allow passage of the vessel out the opposite end. The lock would also be open for certain tidal conditions.

A properly operated lock would remove adverse hydraulic issues, but would also bring significant environmental and OMRR&R issues. A lock would be more detrimental to fish than the other alternatives. OMRR&R costs for this alternative would be much higher than for other alternatives that do not require full-time operation. OMRR&R, not including major maintenance, is estimated to cost approximately $1.2 million to $1.5 million per year. In addition, the time required for construction of this alternative would be longer than that for all other alternatives being considered except alternative #5.

***Single 95-ft wide Navigation Opening with a -16.0 ft Sill***

The initial alternatives evaluated each included a single 95-ft wide navigation opening with a sill elevation of -16.0 ft. The initial evaluations of these alternatives determined that an alignment similar to that in alternative #2 with a single 95-ft wide sector gate closure with a sill elevation of -16.0 ft best served the requirements for that area and was chosen for further development. At the initiation of the detailed design for this alignment, it was determined that the size of the navigation opening was not adequate to pass the required flow without exceeding the acceptable flow velocities. Therefore, this feature was eliminated from further consideration and a larger opening and different gate configurations that would pass the flow at velocities that are acceptable for navigation and human and natural environmental factors were developed and further evaluated as part of various alignments.

## 2.6 SUMMARY TABLE

Table 4 provides a summary of the preliminary alternatives screening results.

**Table 4.**
**Preliminary Alternatives Screening Results**

| Structure | Proposed Action | Alternative #2 | Alternative #3 | Alternative #4 | Alternative #5 | Alternative #3a |
|---|---|---|---|---|---|---|
| Sector Gate | ☑ | ☑ | ☑ | ☑ | ☑ | X |
| Vertical Lift Gates | ☑ | ☑ | ☑ | ☑ | ☑ | X |
| T-wall Floodwalls | ☑ | ☑ | ☑ | ☑ | ☑ | X |
| T-walls on Existing Levees | ☑ | ☑ | --- | --- | --- | X |
| Roadway Gate | ☑ | ☑ | ☑ | ☑ | ☑ | X |
| Railroad Gate | --- | --- | ☑ | ☑ | --- | X |
| Lock | X | X | X | X | --- | X |

X = eliminated from further consideration.
☑= considered in detail.
--- = not applicable – this option was not formulated for this alternative.

# 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## 3.1 ENVIRONMENTAL SETTING

### General

The Tier 2 Pontchartrain project area is located on the south shore of Lake Pontchartrain in the northeastern portion of the Mississippi River deltaic plain (figure 15). The study area is located at the confluence of the IHNC and Lake Pontchartrain and extends approximately 2,500 ft south of the Seabrook Bridge. The study area lies completely within Orleans Parish; however, it defines the dividing line for two sub-basins of the larger Pontchartrain Basin: Orleans East Bank and New Orleans East (figure 16). The Orleans East Bank sub-basin extends westward from the IHNC to the 17th Street Canal and is bordered to the north by Lake Pontchartrain and to the south by the Mississippi River. The New Orleans East sub-basin extends eastward from the IHNC toward the Rigolets Pass and is bordered by Lake Pontchartrain and the GIWW to the north and south, respectively (USACE 1984).

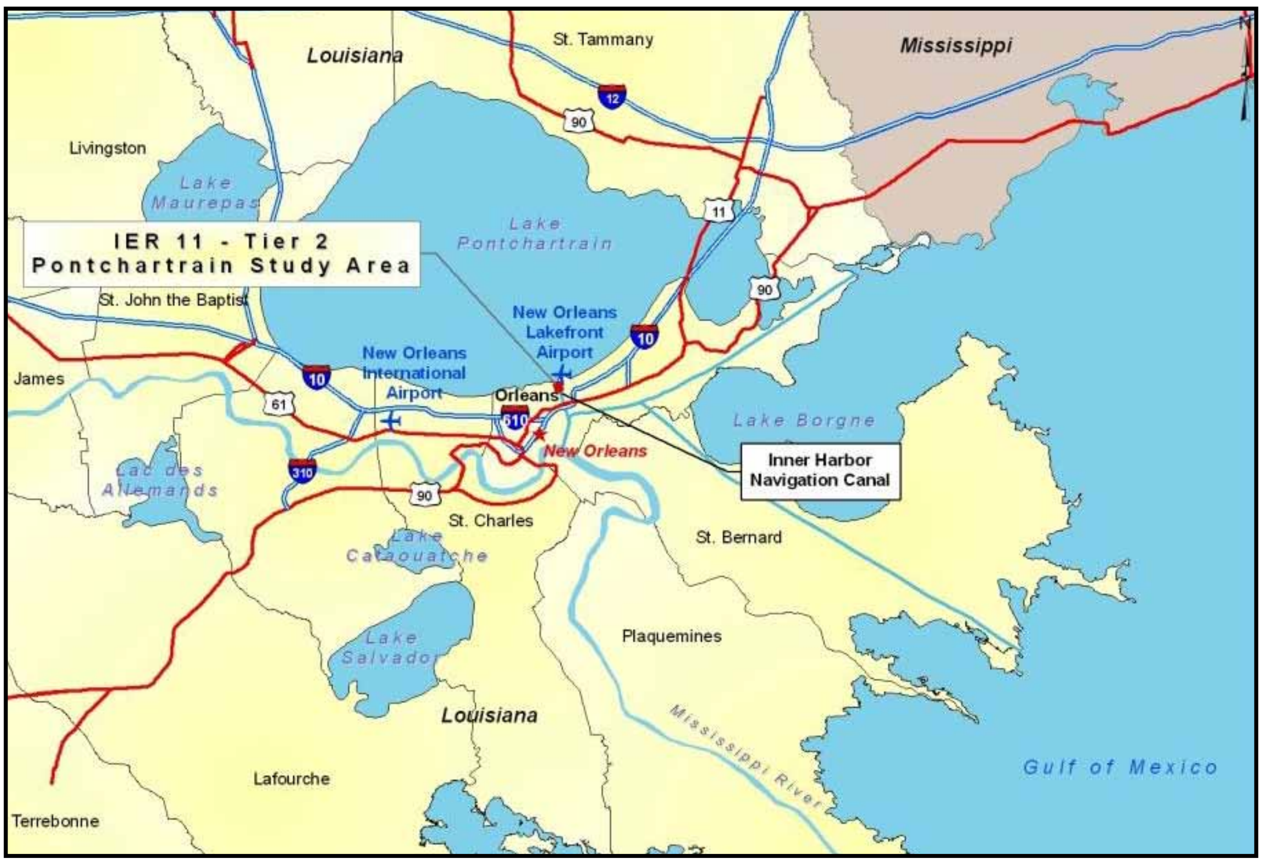



**Figure 15. Regional Map of the Tier 2 Pontchartrain Study Area**

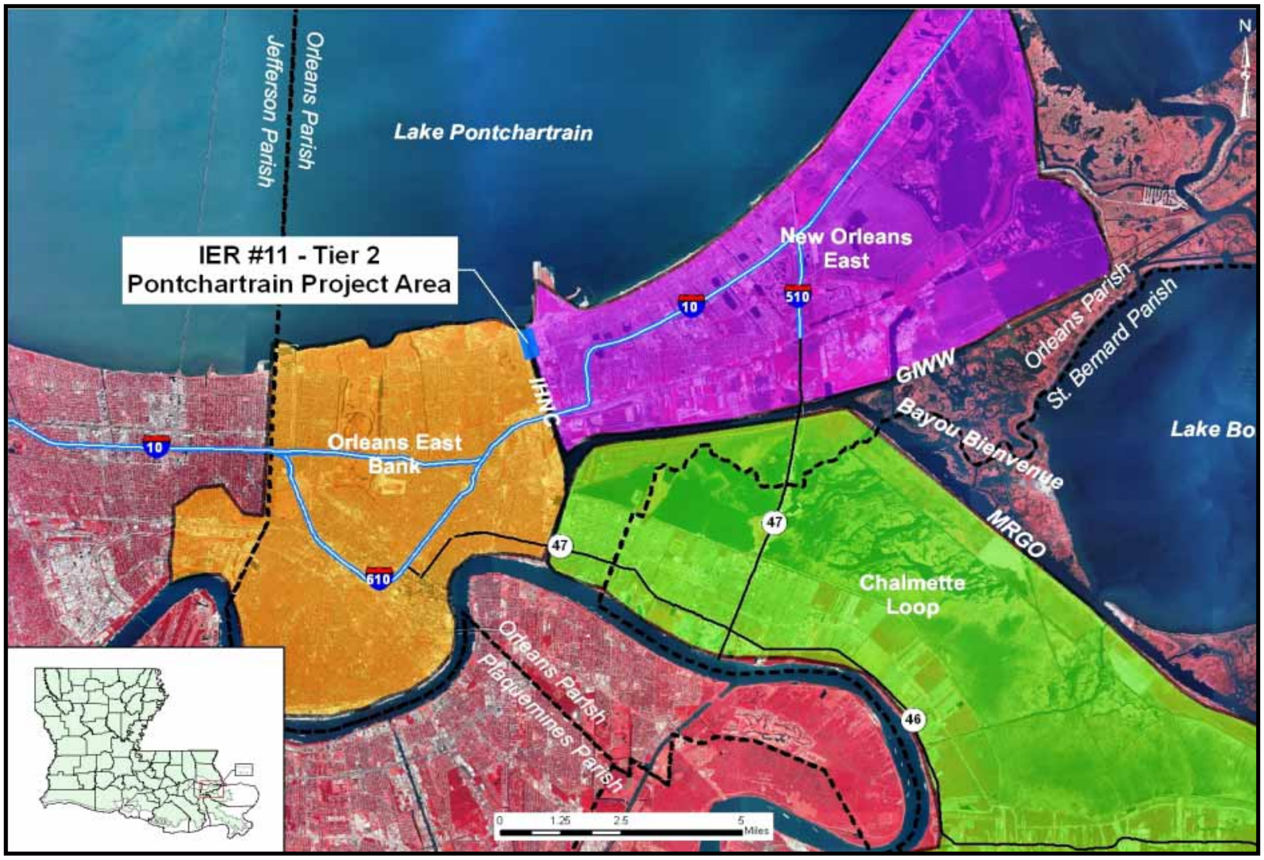



**Figure 16. Tier 2 Pontchartrain Project Area and Pontchartrain sub-basins**

## Climate

Orleans Parish is located within a subtropical latitude. The climate is influenced by the many water surfaces of the nearby wetlands, rivers, lakes, streams, and the Gulf of Mexico. Throughout the year, these water bodies modify relative humidity and temperature conditions, decreasing the range between the extremes. Summers are long and hot, with an average daily temperature of 81 degrees Fahrenheit (°F) and high average humidity. Winters are characterized by cold, dry, polar air masses moving southward from Canada, with an average daily temperature of 53°F. Average annual precipitation is approximately 61 inches with monthly averages varying from 2.8 inches in October to 6.5 inches in July (USACE 1974; National Oceanic and Atmospheric Administration [NOAA] 1987).

Precipitation in Louisiana is largely due to convectional activity in the summer and tropical storms during the winter. Due to its proximity to the Gulf of Mexico, the study area is susceptible to tropical waves, tropical depressions, tropical storms, and hurricanes. These weather events can produce significant amounts of precipitation over a very short period of time and are often accompanied by strong winds, tornadoes, and storm surge along the coastal areas. Analysis of historic data from the National Hurricane Center dataset on tropical cyclones (including tropical depressions, tropical storms, and hurricanes) of the Louisiana coast from 1900 to 1999 shows a total of 63 storms, of which 49 were Category 3 or less. Not all of these storms had direct contact with the New Orleans metro area (U.S. Geological Survey [USGS] 2002a). Since 1999, a total of 10 storms, of which 7 were Category 3 or less, have impacted Louisiana (USACE 2006a).

## Geology and Soils

Dominant physiographic features in the vicinity include Lake Pontchartrain, the lakefront levee, and the IHNC. The surface and shallow subsurface in the study area is composed of up to 18 ft of hydraulic fill from Lake Pontchartrain. Fill deposits contain sand, silt, and clay, overlying lacustrine and beach deposits. Lacustrine deposits are characterized by soft to medium clays with some silt and sand layers and shells and are approximately 10 ft thick. Beach deposits are approximately 30 ft thick and are related to the Pine Island Beach Ridge that trends east-west across the area. The beach deposit is generally composed of silty sand and sand with shells. Beach deposits overlie 5 ft to 10 ft of bay-sound deposits which are characterized by soft to medium clays, silts, and some sand containing shell fragments. Pleistocene deposits are located beneath bay-sound deposits at approximate elevation of -50 ft NAVD88. These deposits are mainly stiff to very stiff, oxidized clays, silts, and sands. The study area also contains Aquent soils, which are poorly drained soils that are stratified and clayey to mucky throughout, resulting from hydraulically dredged material (U.S. Department of Agriculture, Soil Conservation Service 1989). Groundwater has been artificially lowered at the study area by forced drainage. The sands and silts in the fill and beach deposits may be hydraulically connected to Lake Pontchartrain or the IHNC (USACE 2008a).

As part of the Seabrook Phase II Environmental Site Assessment (ESA), four boreholes were drilled in the IHNC near the proposed action alignment (USACE 2007a). Sample locations were based on site conditions, such as water depth, due to limitations of the drilling equipment. The sampling locations were also influenced by the geologist's discretion to represent potential construction areas. Each hole was drilled to a depth of 5 ft and the material sampled was described as medium to dark grey, very moist, odorless sand or sandy clay (USACE 2007a).

Soil borings collected from the project vicinity can provide information on the nature and extent of soils and shallow sediments, along with their physical and engineering properties. The Phase II – 100 percent Submittal Engineering Analysis Report for Seabrook Floodgate reported that subsurface conditions at the site of the proposed action were based primarily on 11 borings (USACE 2008b). The majority of borings were drilled in March 2008, and with the exception of one boring taken at the limits of the scour hole and one within the footprint of the gate, most borings occurred along or near the alignment of proposed levees that would connect to the gate structure. The subsurface along the alignment of the proposed action consists of a 4 ft to 10 ft think layer of silt, atop a 7 ft to 12 ft thick layer of clay. Underneath the clay is a relatively thick sequence of sand (approximately 38 ft thick), followed by another layer of clay. This clay layer is approximately 10 ft in thickness, and is present across the entire site area. A second sequence of sand exists under this clay and is also present across the site. The sand is underlain by a third layer of sand. Sand found along the alignment of the proposed action is dense to very dense and appears to be part of the Pleistocene Prairie Formation. Elevation of the Pleistocene layer tends to vary along the alignment but generally, on the west side of the IHNC the top is located between El -85.0 ft and -90.0 ft NAVD88, and on the east side of the channel between El -100.0 ft and -140.0 ft NAVD88 (USACE 2009b).

Figure 17 illustrates past and future soil borings within the project area. Historical boring locations are represented on figure 17 by purple dots, whereas proposed soil boring and proposed cone penetrometer test (CPT) dots are colored yellow and pink, respectively. The proposed borings have been completed and the CPTs will be conducted prior to construction.

Additional information related to geologic history and setting can be found in section 3.1.1 of the IER #11 Tier 1 document.

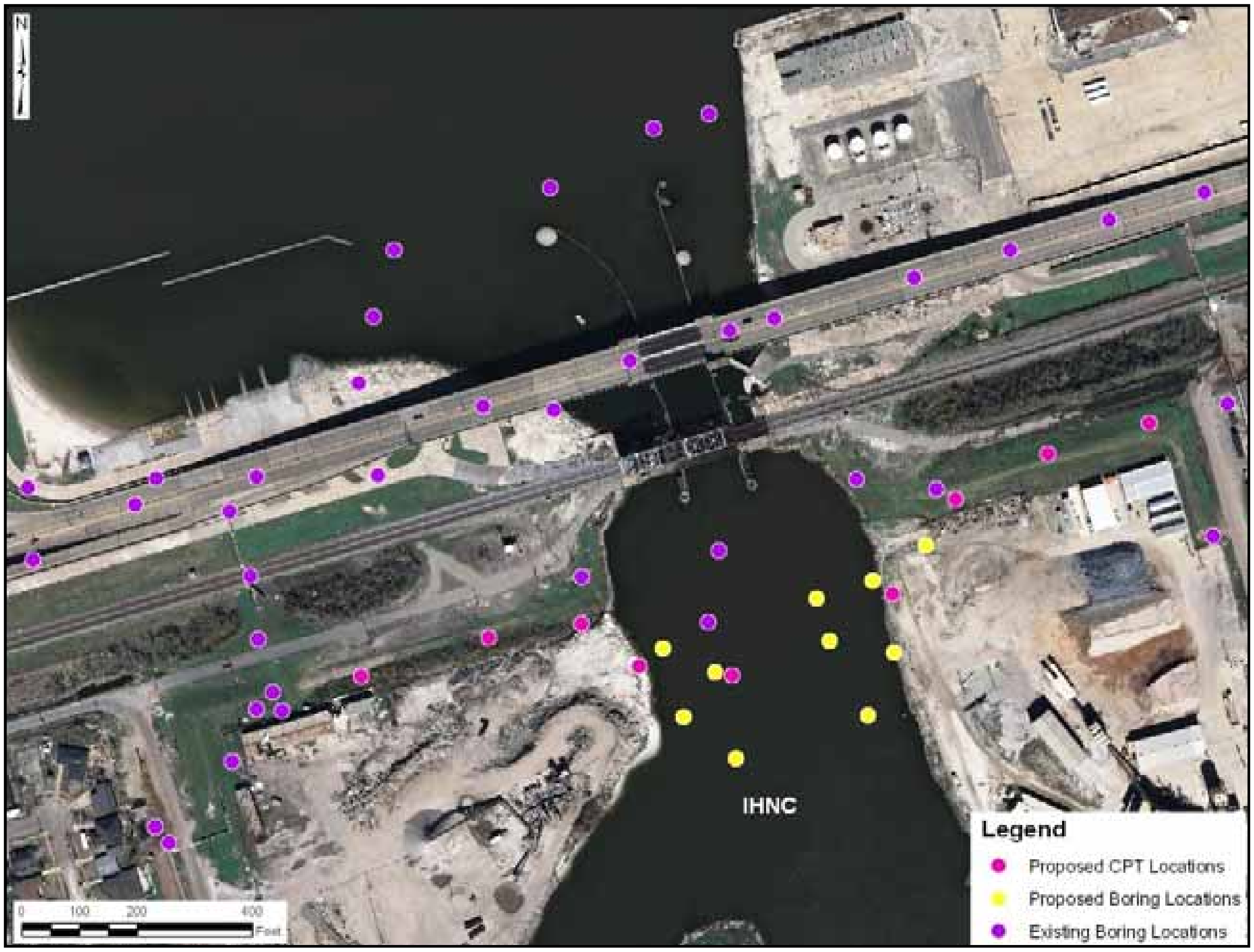


**Figure 17. Soil Boring Locations in the Tier 2 Pontchartrain Project Area**

**Hurricane Katrina and On-going Construction Activities**

On 29 August 2005, Hurricane Katrina made landfall near Buras on the Louisiana Coast south of New Orleans. At landfall, Hurricane Katrina was at the upper end of Category 3 intensity range with maximum sustained winds estimated at 123 miles per hour (mph). As a result of storm surge, large areas of New Orleans East and St. Bernard Parish were flooded due to the over-topping and breaching of levees and floodwalls on the INHC, the GIWW, and the MRGO. Additionally, the Orleans East Bank was flooded due to breaching of levees and floodwalls associated with Lake Pontchartrain, located within the Orleans East Bank sub-basin and areas west.

On 24 September 2005, Hurricane Rita hit the western part of Louisiana and the storm surge inflicted additional damage in the project vicinity, re-flooding areas in the ninth ward and Gentilly prior to making landfall near the Texas-Louisiana border. The damages to Orleans Parish's residences were widespread, and at least 10 of the 29 historic districts in the parish suffered extensive damage from flooding.

## 3.2 SIGNIFICANT RESOURCES

This section contains a list of the significant resources located in the vicinity of the proposed action, and describes in detail those resources that would be impacted, directly or indirectly, by the alternatives. Direct impacts are those that would be caused by the action taken and occur at the same time and place (40 CFR 1508.8(a)). Indirect impacts are those that would be caused by the action and would be later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8(b)). Cumulative impacts are discussed in section 4.

The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of National, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Further detail on the significance of each of these resources can be found by contacting the CEMVN, or on www.nolaenvironmental.gov, which offers information on the ecological and human value of these resources, as well as the laws and regulations governing each resource. Search for "Significant Resources Background Material" in the website's digital library for additional information.

Table 5 shows those significant resources found within the project area, and notes whether they would be impacted by any of the alternatives analyzed in this IER.

**Table 5.**
**Significant Resources in the Project Study Area**

| Significant Resource | Impacted | Not Impacted |
|---|---|---|
| Hydrology | X | |
| Water Quality | X | |
| Wetlands | X | |
| Fisheries | X | |
| Essential Fish Habitat | X | |
| Wildlife | | X |
| Threatened and Endangered Species | X | |
| Non-wet Uplands | | X |
| Cultural Resources | | X |
| Recreational Resources | X | |
| Aesthetic (Visual) Resources | | X |
| Air Quality | X | |
| Noise | X | |
| Navigation | X | |
| Transportation | X | |
| Socioeconomic Resources | | |
| Land Use, Population, Employment | X | |
| Environmental Justice (EJ) | | X |

### 3.2.1 Hydrology

Existing Conditions

As described in IER #11 Tier 1 (USACE 2008a), the Lake Pontchartrain Basin includes the estuarine areas of Lake Pontchartrain and Lake Borgne. The basin has been substantially altered by a system of waterways, levees, and hydraulic control structures which range in size from the Mississippi River to oil well access canals. Navigable waterways within the basin that have been previously dredged, such as the GIWW and the IHNC, contribute to the alteration of the natural hydrology of the area.

The IHNC is hydrologically connected to the GIWW, the MRGO, the Mississippi River, and Lake Pontchartrain. The IHNC is approximately 35 ft deep, with a minimum 150 ft bottom width and 300 ft top width. The IHNC lock is located at the southern terminus of the IHNC and allows waterborne traffic to transit to and from the Mississippi River, the GIWW, and Lake Pontchartrain. From the GIWW/MRGO confluence to the IHNC Lock is an authorized deep draft navigation channel, 36 ft deep and 500 ft wide. The GIWW west of the Michoud Canal is authorized as a 36-ft deep, 500-ft bottom wide waterway. The MRGO was deauthorized as a Federal waterway on 5 June 2008 with a rock closure structure at Bayou La Loutre.

The major influences on water levels within the basin are wind and tide. Tidal ranges average approximately 1 ft and 2 ft at Lake Pontchartrain and Lake Borgne, respectively (Westerink et al. 2006). Average flow velocity in the IHNC is about 0.6 feet per second (fps); however, surface ebb and bottom velocities may exceed 2 fps (USACE 1997). More recent velocity modeling (USACE 2009c) has indicated that closures of the MRGO at Bayou La Loutre and south of Bayou Bienvenue results in decreased velocities within the IHNC.

The basin is susceptible to flooding from hurricane storm surge. Lake Pontchartrain levels are increased by the influx of surges from Lake Borgne and the Gulf of Mexico that accompany hurricanes from the southeast, south, and southwest, as well as from local wind setup (USACE 1967; USACE 1995; USACE 2007b; Westerink et al. 2006).

Modeling conducted by the Interagency Performance Evaluation Task Force (IPET) indicates that the HSDRRS has effects on storm surge within the area of the IHNC and GIWW due to its connection with Lake Borgne and Lake Pontchartrain (USACE 2007c). Storm surge experienced in the GIWW and the IHNC is a function of that generated from both Lake Borgne in the east and Lake Pontchartrain in the north.

During major storm events, storm surges can propagate north into Lake Borgne and are then redirected west into the IHNC, resulting in higher surge levels. Modeling analysis of conditions during Hurricane Katrina suggests that waves up to 4 ft high occurred within the IHNC (USACE 2007c). Observed peak water levels in the IHNC during Hurricane Katrina indicated a maximum water level increase of at least 6 ft between the confluence of the MRGO/GIWW and Lake Pontchartrain.

The historic gage record (1923 to 2006) at the IHNC Lock shows that the median range of low to high water levels is -0.79 to 3.71 ft National Geodetic Vertical Datum of 1929 (NGVD29). However, water levels reached 10.61 ft (NGVD29) during Hurricane Betsy and the highest recorded water level (high water mark) at the IHNC Lock, due to Hurricane Katrina, was recorded at 14.3 ft (NGVD29; USACE 2007c).

In addition to flows and water levels, sediment transport is another aspect of hydrology. The conveyance of sediment in the water column can significantly affect aquatic habitat, including benthic fauna and emergent wetland plants. Suspended sediment is important to the biological structure and function of a water body or wetland, and the amount and composition of suspended sediments is affected by both natural and human factors. Sediment can also be attributed to erosion. The bank erosion is partially due to wave action, tidal movement, vessel traffic, and the effect of storm surges. Dredging can be required to remove deposited sediment after severe storms in addition to normal annual maintenance dredging activities (USACE 2007d).

Discussion of Impacts

Impacts to hydrology were assessed based on the potential for changes in velocity, surface water elevation and circulation within the Lake Pontchartrain Basin. The key hydrodynamic model applied during this study was an Adaptive Hydraulics (ADH) code utilizing 2-dimensional shallow water equations. Water surface analyses examined 16 locations within the modeling domain including points within Lake Pontchartrain, Chef Menteur Pass, the Rigolets, the IHNC, Lake Borgne, the GIWW, and the MRGO. Circulation changes were assessed by determining velocity signals at two locations within the GIWW, one on the eastern side of the MRGO and one on the western side (USACE 2009c). The ADH model was validated utilizing 2008 field data on surface water elevations, discharge, and velocity. While modeling results were closely aligned with field data, it should be noted that the modeled scenarios do not include culverts within the Borgne Barrier through Bayou Bienvenue, which will be installed to allow some flow, during construction of the Bayou Bienvenue gate structure.

ADH modeling efforts included analysis of a base condition and four plan scenarios that were simulated for two, 2-week periods. March 2008 (referred to as “spring”) and September 2007 (referred to as “fall”) were selected as the simulation periods. These time periods were chosen by the interagency team to best coincide with high tide events and aquatic organism migration seasons. ADH modeling scenarios are presented in table 6.

**Table 6.**
**ADH Modeling Scenarios (USACE 2009c)**

| Scenario | MRGO at La Loutre | Borgne Barrier | Seabrook | Comments |
|---|---|---|---|---|
| Base | No closure | No structures | No structures | The base condition simulates conditions within the Pontchartrain Basin prior to the closure of the MRGO at Bayou La Loutre and prior to completion of the Borgne Barrier. |
| Plan 1 | Closure | No structures | No structures | Simulates hydrologic conditions following the MRGO closure at Bayou La Loutre. |
| Plan 2 | Closure | Structures on Bayou Bienvenue and GIWW | No structures | Simulates existing conditions for purposes of IER 11 Tier 2 Pontchartrain, includes the Plan 1 scenario with the addition of the Borgne Barrier. |
| Plan 3 | Closure | Structures on Bayou Bienvenue and GIWW | 95 ft by 16 ft sector gate | Plan 3 includes the Plan 2 scenario with a simulated 95 ft x 16 ft gate at Seabrook. |
| Plan 3 final | Closure | Structures on Bayou Bienvenue and GIWW | 95 ft by 20 ft sector gate with two 50 ft by 16 ft auxiliary gates | Plan 3 Final simulates a 95 ft x 20 ft sector gate with two additional 50 ft x 16 ft auxiliary gates (e.g., proposed action). |

The results of these modeling scenarios are summarized in the following sections. Information on accessing the modeling reports can be found in appendix B.

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Hydrology*

Modeling has shown that the proposed structure could result in permanent velocity changes within the navigable waterways of the project area. Modeling results, based on a point located in the center of the proposed sector gate within the IHNC, predicted average flood and ebb flows with the proposed action in place on the order of 2.13 fps to 2.24 fps during the fall and 2.33 fps to 2.63 fps during the spring; a maximum velocity of 4.97 fps was noted. Simulated average velocities for the existing conditions within the IHNC are 1.32 fps to 1.37 fps during the fall and 1.46 fps to 1.62 fps during the spring, with a maximum expected velocity of 3.23 fps. Although with implementation of the proposed action there would be expected to be an increase in velocities within the Seabrook gate above the existing conditions, velocities would be expected to be on the order of those historically experienced (prior to the MRGO closure at Bayou La Loutre and Borgne Barrier in place) within the channel. Historical average velocities range from approximately 2.40 fps during the fall to 2.73 fps in the spring, with a maximum velocity of 4.98 fps (USACE 2009c).

With implementation of the proposed action, changes in the tidal range within the IHNC would also be expected. This is partially due to the restriction of flow that would result from placing floodgates across the IHNC. Alterations in tidal range to the south of the proposed structures are anticipated to be greater than to the north due to filling of the existing scour hole. This influence extends southward within the IHNC to the point at which the IHNC and GIWW intersect. Changes in tidal range within the IHNC are depicted in figures 18, 19, and 20 (USACE 2009c).

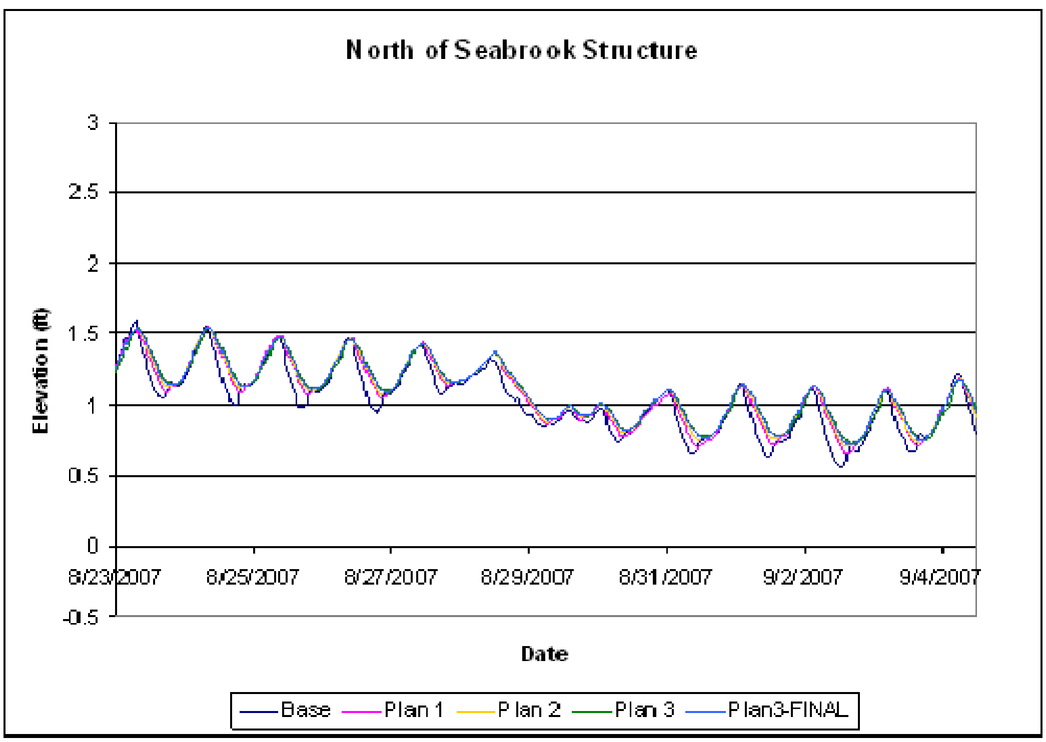



**Figure 18. Water Surface Elevations North of Seabrook Structure (September)**

Existing conditions with the MRGO closure structure at La Loutre and the Borgne Barrier in place are reflected within modeling scenario 'plan 2' and the proposed action is represented by the 'plan 3-Final' modeling scenario.

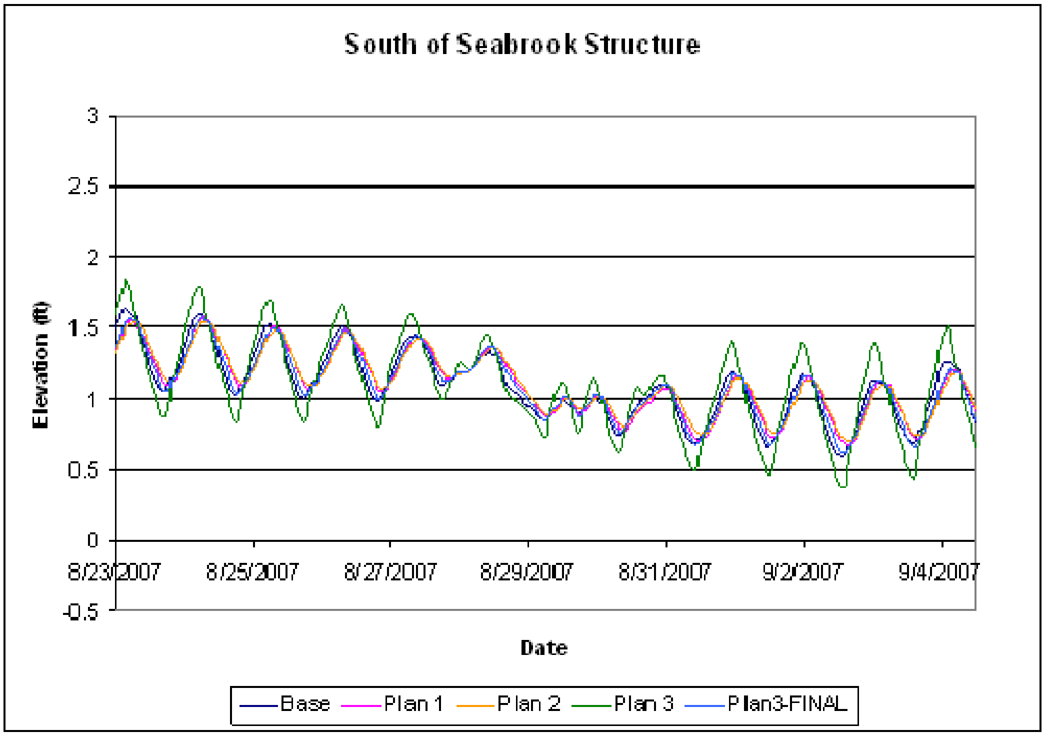



**Figure 19. Water Surface Elevations South of Seabrook Structure (September)**

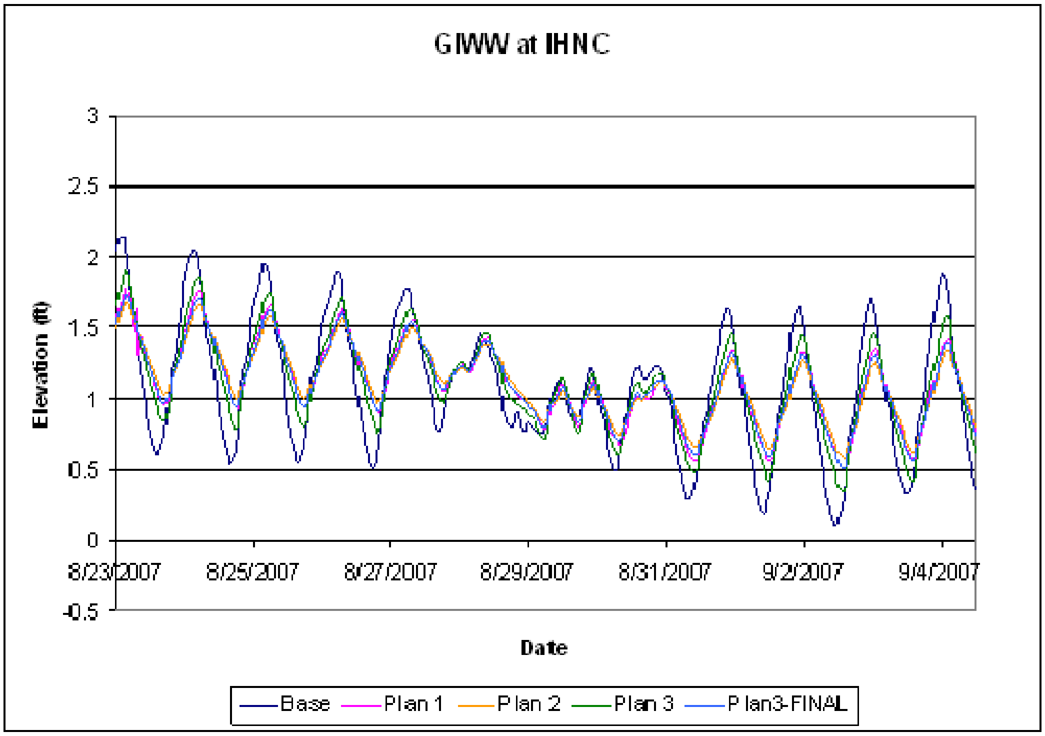



**Figure 20. Water Surface Elevations in GIWW at IHNC (September).**

Temporary direct impacts to hydrology would also be expected during construction of the gate structures. Velocity and circulation would be cut off between Lake Pontchartrain and the IHNC by the placement of a cofferdam that would span the width of the IHNC for approximately 6 months to 12 months.

In addition to routine maintenance once the Seabrook gates are in place, they may have to be operated approximately 10 times a year to control/reduce velocities of the gates on the GIWW. These temporary closures would result in impacts similar to those described for the period of time when the cofferdam is in place.

The construction of the Lake Borgne Barrier and the Seabrook Gate Structure will provide significant reduction in risk to New Orleans metropolitan area by preventing storm surges from entering the IHNC and GIWW system, here referred to as the IHNC basin. Businesses already located on the floodside of the existing parallel protection that would experience a 15-ft storm surge on average (a range from 10 ft to 20 ft is experienced throughout the system) during the 1 percent annual flood exceedance event without the construction of the barriers would experience a reduced water elevation of 8 ft with the barriers in place. The elevation of 8 ft is derived considering the following factors:

- Base water elevation of the IHNC and GIWW of 3 ft at gate closure.
- Allowable overtopping of the Lake Borgne Barrier.
- Rainfall runoff collected by the city's drainage/pump system.
- Rainfall directly over the IHNC and GIWW.
- *The rainfall used for this calculation is a 10-year, 24-hour event that occurs coincidentally with the 1 percent annual flood exceedance event.*
- *Drainage pumping assumes all rainfall collected and all pumps operating at 100 percent efficiency.*

The operating plan for the Borgne Barrier and Seabrook Structure is currently being developed. Development of this plan is being done in coordination with the local sponsors to include Office of Coastal Protection and Restoration (OCPR) and Southeast Louisiana Flood Protection Authority-East, the U.S. Coast Guard, navigation industry, and numerous U.S. Army Corps of Engineers offices.

Stage and rainfall data from 18 historic named storms that occurred over the past 20 years have been evaluated. These historical stages were compared to the estimated stages that would have occurred for these same events (under the condition with the Seabrook Structure and Borgne Barrier in place) to determine the risk reduction that the barriers provide to the IHNC basin. Analysis of historical records showed that greater risk reduction would be obtained for all these historical storm events had the barriers been in place. Included in this analysis is rainfall and runoff being pumped into the system as well as overtopping. In all cases, water levels in the system would have been equal to or reduced as outlined in table 7. Water would not be stored in the system longer than if the barriers were not constructed. Once lake and internal water levels allow, the gates would be opened.

The storm damage and risk reduction function of the barriers is clearly illustrated by the examples of the severe events; Georges (1998), Katrina (2005) and Gustav (2008).

**Table 7.**
**Water levels within the IHNC basin for two cases:**
**1) existing conditions without barriers in place and 2) conditions with barriers in place**

| Storm | Name | year | max observed still water level [ft] (case 1) | rainfall [inch] | Water level increase in IHNC basin due to pumps [ft] | Water level increase due to overtopping [ft] | estimated IHNC basin water level (case 2) | storm damage risk reduction [ft] |
|---|---|---|---|---|---|---|---|---|
| Tropical Storm | Beryl | 1988 | 6.2 | 7.0 | 1.6 | 0.0 | 5.2 | -1 |
| Hurricane | Florence | 1988 | 7.0 | 1.0 | 0.3 | 0.0 | 3.3 | -4 |
| Hurricane | Andrew | 1992 | 5.0 | 3.0 | 0.8 | 0.0 | 4.0 | -1 |
| Tropical Storm | Dean | 1995 | 5.0 | 5.0 | 1.2 | 0.0 | 4.6 | 0 |
| Hurricane | Opal | 1995 | 5.0 | 1.0 | 0.3 | 0.0 | 3.3 | -2 |
| Hurricane | Danny | 1997 | 5.5 | 1.0 | 0.3 | 0.0 | 3.3 | -2 |
| Hurricane | Earl | 1998 | 5.0 | 1.0 | 0.3 | 0.0 | 3.4 | -2 |
| Hurricane | Georges | 1998 | 9.0 | 1.0 | 0.3 | 0.0 | 3.3 | -6 |
| Tropical Storm | Isidore | 2002 | 8.0 | 10.0 | 2.2 | 0.0 | 6.0 | -2 |
| Hurricane | Lili | 2002 | 6.5 | 3.0 | 0.8 | 0.0 | 4.0 | -3 |
| Tropical Storm | Bill | 2003 | 6.0 | 7.0 | 1.6 | 0.0 | 5.2 | -1 |
| Hurricane | Ivan | 2004 | 7.5 | 1.0 | 0.3 | 0.0 | 3.3 | -4 |
| Hurricane | Cindy* | 2005 | 7.0 | 7.0 | 1.6 | 0.0 | 5.2 | -2 |
| Hurricane | Katrina** | 2005 | 13.0 | 13.0 | 2.8 | 0.5 | 6.9 | -6 |
| Hurricane | Rita** | 2005 | 7.0 | 1.0 | 0.3 | 0.0 | 3.3 | -4 |
| Hurricane | Gustav | 2008 | 11.0 | 7.0 | 1.6 | 0.0 | 5.2 | -6 |
| Hurricane | Ike | 2008 | 9.0 | 1.0 | 0.3 | 0.0 | 3.3 | -6 |
| Hurricane | Ida | 2009 | 5.1 | 1.0 | 0.3 | 0.0 | 3.3 | -2 |

* For Hurricane Cindy no water levels were recorded in the vicinity of the IHNC, +4.5ft water levels were observed at the Rigolets. Based on linear correlation between the two stations, stages are estimated to be approximately 7ft.;

** For Katrina and Rita estimates are based upon model runs and high water mark observations due to the fact that most gages were destroyed during the peak of Katrina.

*Indirect Impacts to Hydrology*

Hydrologic changes may indirectly correlate to both temporary and permanent impacts to water quality and aquatic habitat. These indirect impacts are primarily due to changes in salinity and dissolved oxygen (DO) that are heavily influenced by hydrologic changes. These changes have the potential to impact both aquatic and terrestrial species. These impacts are discussed in further detail in sections 3.2.4 through 3.2.7.

*Cumulative Impacts to Hydrology*

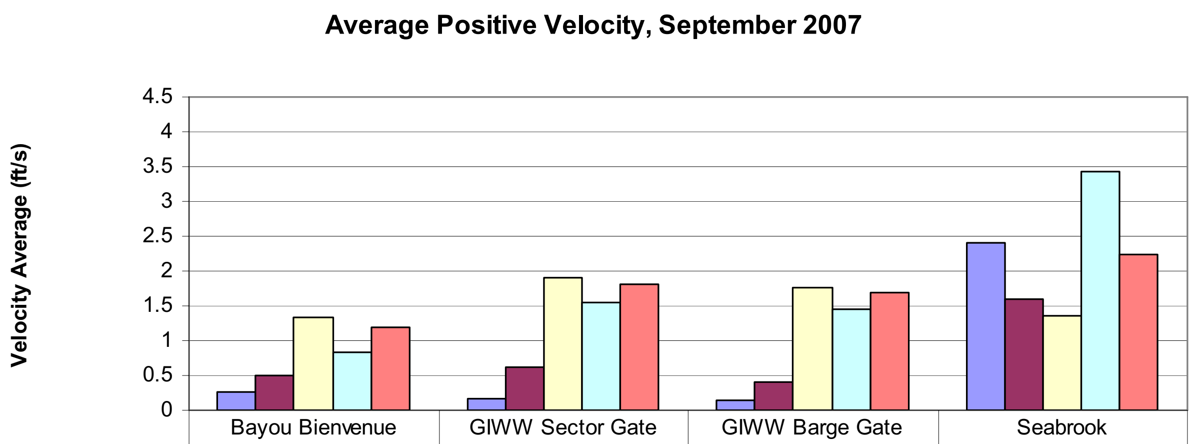
Cumulative impacts from the proposed action would involve the combined effects from the multiple HSDRRS projects and Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) projects throughout the project vicinity; the Violet freshwater diversion project; and MRGO closure structure at La Loutre. The combined effects of other projects including the Borgne Barrier, the closure of the MRGO at Bayou La Loutre, and the Violet Diversion would result in varying degrees of altered hydrology throughout the project area. Direct and indirect changes to the project area are discussed previously, but the changes from the combination of IER and CWPPRA projects would lead to substantial long term cumulative impacts to the hydrology of the Lake Pontchartrain Basin and nearby vicinity.

By providing a storm surge barrier across the IHNC, the incremental effect of the proposed action, in combination with other projects in the vicinity, would significantly reduce the effect of surges from extreme events up to the 100-year storm level. This would result in further enhancement of the entire proposed 100-year HSDRRS throughout the area (USACE 2008a).

By incrementally adding structures to the modeling plans, the ERDC ADH model was designed to simulate the cumulative impacts of the MRGO closure at Bayou La Loutre, the Borgne Barrier, and the proposed action. Modeling results indicate that closing the MRGO at La Loutre (plan 1) creates large changes to surface water velocities, surface water elevations, and circulation patterns within the Lake Pontchartrain Basin. These parameters would continue to change with the implementation of the Borgne Barrier (plan 2) and the proposed action (plan 3 final).

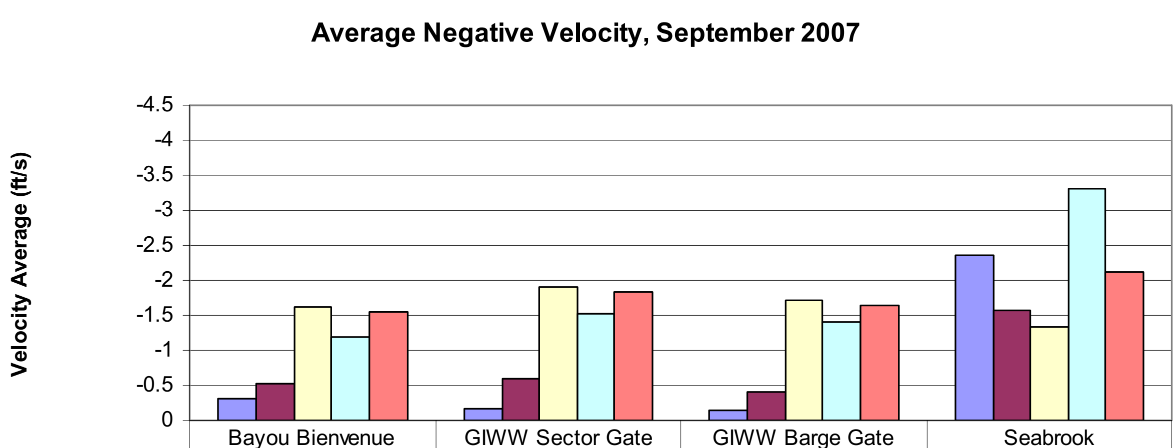
Modeling results are reported in positive and negative numbers to demonstrate flood and ebb tidal movement. Positive velocity numbers represent directional flow to the north or east and negative numbers represent directional flow to the south and west. Modeled data for plan 1 predict average velocities in the IHNC of 1.59 fps and -1.57 fps in September along with 1.87 fps and -1.68 fps in March (USACE 2009c). With the addition of the Borgne Barrier (plan 2), modeled data predicts a decrease in average velocities in the IHNC. Under plan 3 final (proposed action), velocities would be expected to increase during March and September conditions. Average velocities during March would increase to 2.63 fps and -2.33 fps and the average velocity during September would increase to 2.24 fps and - 2.13 fps.

Similar impacts as described previously within the IHNC would also be experienced within the GIWW and Bayou Bienvenue. Figures 21 through 24 provide the average positive and negative velocities modeled for the September and March timeframes.



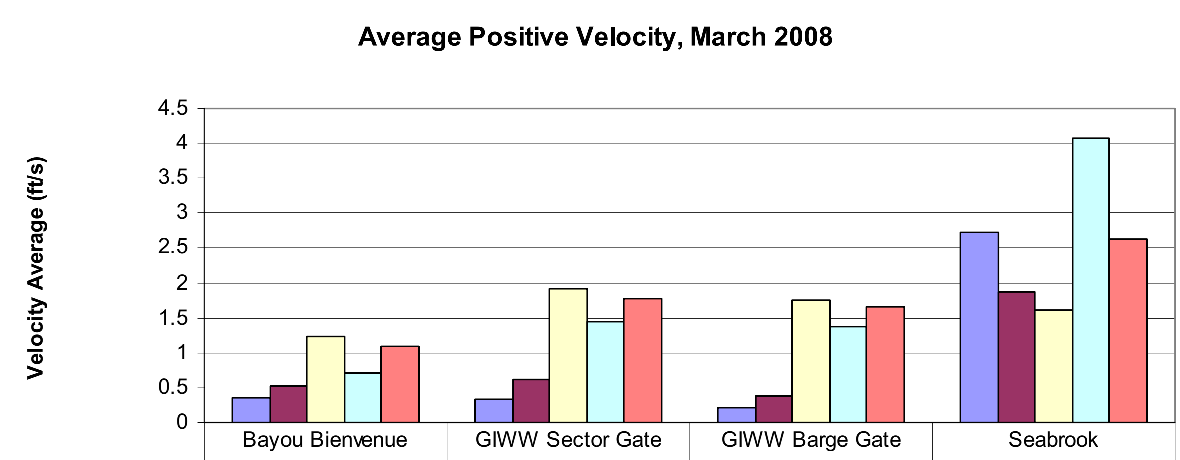

| | Bayou Bienvenue | GIWW Sector Gate | GIWW Barge Gate | Seabrook |
|---|---|---|---|---|
| Base | 0.261 | 0.163 | 0.145 | 2.410 |
| Plan 1 | 0.500 | 0.628 | 0.407 | 1.585 |
| Plan 2 | 1.332 | 1.910 | 1.752 | 1.368 |
| Plan 3 | 0.843 | 1.545 | 1.460 | 3.435 |
| Plan 3 Final | 1.194 | 1.804 | 1.682 | 2.240 |

**Figure 21. Velocity Average for September (positive)**



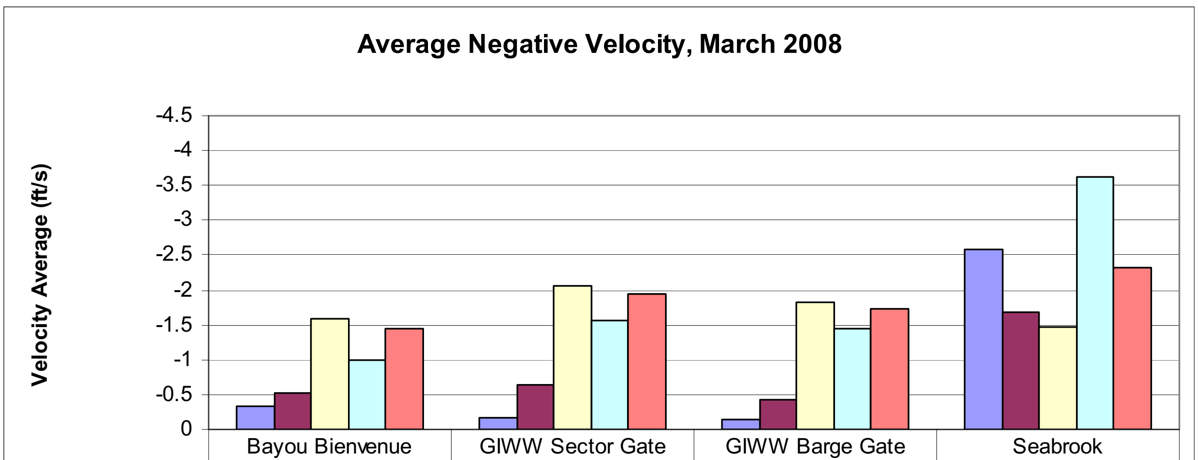

| | Bayou Bienvenue | GIWW Sector Gate | GIWW Barge Gate | Seabrook |
|---|---|---|---|---|
| Base | -0.32 | -0.16 | -0.15 | -2.36 |
| Plan 1 | -0.51 | -0.60 | -0.41 | -1.57 |
| Plan 2 | -1.62 | -1.91 | -1.72 | -1.32 |
| Plan 3 | -1.20 | -1.52 | -1.40 | -3.30 |
| Plan 3 Final | -1.54 | -1.83 | -1.64 | -2.13 |

**Figure 22. Velocity Average for September (negative)**




| | Bayou Bienvenue | GIWW Sector Gate | GIWW Barge Gate | Seabrook |
|---|---|---|---|---|
| Base | 0.36 | 0.32 | 0.21 | 2.73 |
| Plan 1 | 0.51 | 0.61 | 0.39 | 1.87 |
| Plan 2 | 1.23 | 1.92 | 1.76 | 1.62 |
| Plan 3 | 0.70 | 1.46 | 1.38 | 4.07 |
| Plan 3 Final | 1.08 | 1.78 | 1.65 | 2.63 |

**Figure 23. Velocity Average for March (positive)**




| | Bayou Bienvenue | GIWW Sector Gate | GIWW Barge Gate | Seabrook |
|---|---|---|---|---|
| Base | -0.33 | -0.18 | -0.14 | -2.59 |
| Plan 1 | -0.53 | -0.65 | -0.42 | -1.68 |
| Plan 2 | -1.58 | -2.06 | -1.83 | -1.46 |
| Plan 3 | -1.01 | -1.56 | -1.45 | -3.63 |
| Plan 3 Final | -1.43 | -1.93 | -1.73 | -2.33 |

**Figure 24. Velocity Average for March (negative)**

Water Surface Analysis

Changes in water surface elevations are most noticeable at the MRGO closure at Bayou La Loutre according to the ADH model simulations. North of the closure, a 2.5 hour lag in tidal phasing is predicted. With the implementation of the Borgne Barrier and the proposed action, the elevation ranges continue to drop; however, these differences are less extreme (USACE 2009c).

Water Circulation Analysis

The ADH model results for both September and March predict a clear change in circulation once the MRGO is cut off from the Gulf of Mexico. Figure 25 shows the direction of flow when the tide is rising for the model base condition. The flow moves up the MRGO and splits at the GIWW, with a portion moving west and up the IHNC and a portion moving east down the GIWW.

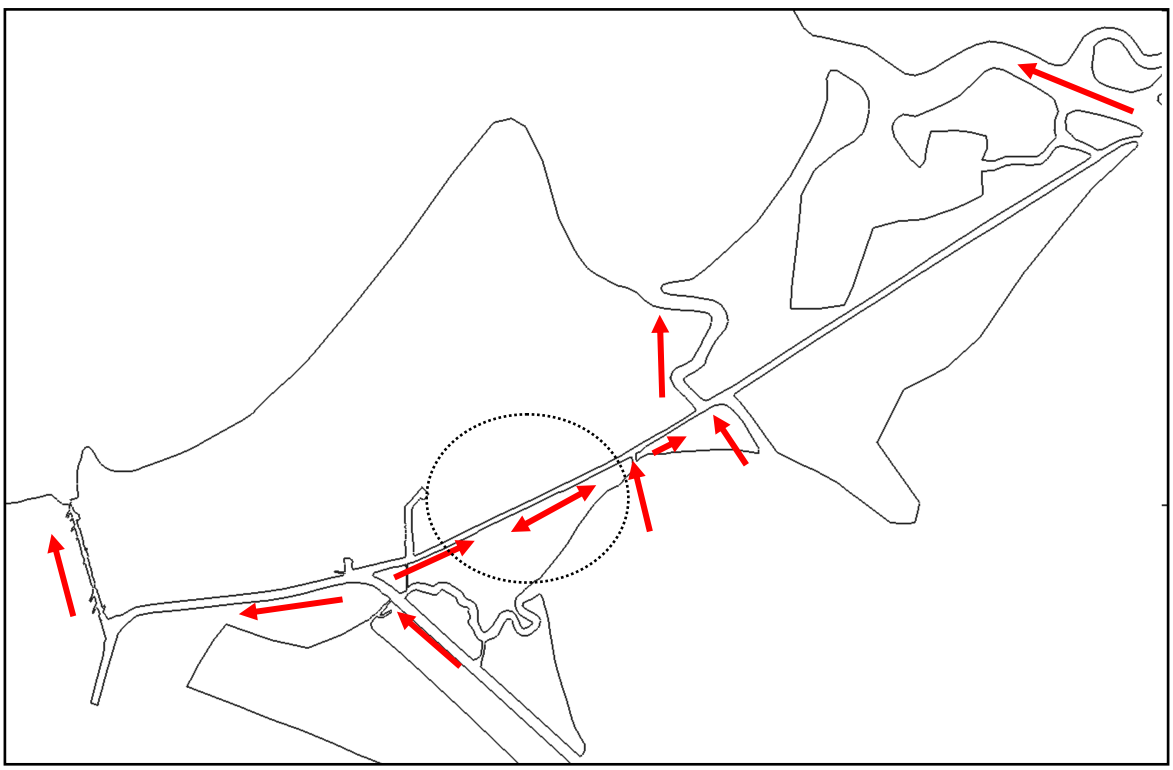


**Figure 25. Direction of Flow for Incoming Tide under Base Conditions**

Figure 26 shows the direction of flow for the incoming tide under plans 1, 2, 3, and plan 3 final. Once the MRGO is cut off from the Gulf of Mexico at La Loutre, the tide cannot move up this channel as it previously did. Therefore the flow only enters the GIWW at its connections at Lake Borgne. Flow does move through Bayou Bienvenue, but the amount of water it transports is much less than the flows that move up the MRGO or enter through Lake Borgne, and it has little effect on the overall circulation pattern through the GIWW. These changes show a clear direction of flow along the GIWW as opposed to a direction that may vary at times.

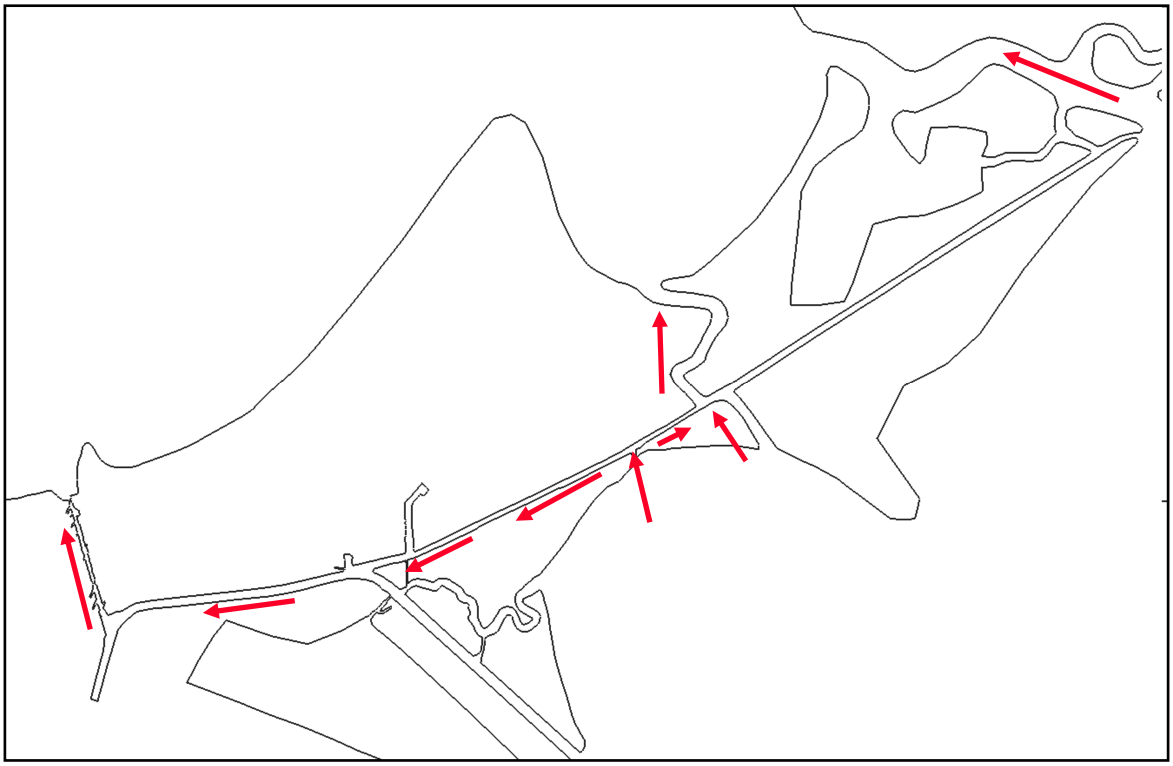


**Figure 26. Direction of Flow for Incoming Tide under Plans 1, 2, 3, and Plan 3 Final**

The implications of changes in velocity, water surface elevation, and circulation patterns to aquatic resources and fisheries, essential fish habitat (EFH), and navigation are discussed in the in detail in sections 3.2.4, 3.2.5, and 3.3.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to Hydrology*

Hydrologic changes such as changes in surface water velocities and circulation patterns would be similar to those discussed for the proposed action. Temporary impacts from construction activities and temporary placement of the cofferdam would also be similar to the proposed action. Alternative #2 requires only partial filling of the scour hole, which would potentially result in fewer changes to tidal flow than would be expected under the proposed action. Filling the scour hole has been modeled to also contribute to a reduction in cross-sectional flow within the IHNC beyond that caused simply by the floodgates.

*Indirect Impacts to Hydrology*

Indirect impacts to hydrology in the study area would be similar to those experienced with implementation of the proposed action. As with the proposed action, hydrologic changes resulting from implementation of this alternative may indirectly correlate to both temporary and permanent impacts to water quality and aquatic habitat. These impacts are discussed in further detail in sections 3.2.4 through 3.2.7.

*Cumulative Impacts to Hydrology*

Cumulative impacts to hydrology under alternative #2 would be similar to those described under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Hydrology*

Direct impacts to hydrology from alternative #3 would be similar to those discussed under the proposed action. Unlike the proposed action however, no scour hole would require filling under this alternative. Therefore, changes in tidal flow would be experienced immediately around the vicinity of the gate structures, but not as a result of constriction of the channel due to the filling of the scour holes.

During construction, a temporary braced cofferdam would be installed around the approximate perimeter of the floodgates for a period of approximately 6 months to 12 months. Due to the location of alternative #3, this cofferdam would not block all flow between Lake Pontchartrain and the IHNC. As a result, temporary impacts to hydrology such as changes in velocity, water surface elevations, and circulation patterns would be less with alternative #3 when compared to the proposed action because some flow would be allowed into Lake Pontchartrain between the shoreline and the cofferdam.

*Indirect Impacts to Hydrology*

Indirect impacts to hydrology from alternative #3 would be similar to those described under the proposed action. As with the proposed action, hydrologic changes resulting from implementation of this alternative may indirectly correlate to both temporary and permanent impacts to water quality and aquatic habitat. These impacts are discussed in further detail in sections 3.2.4 through 3.2.7.

*Cumulative Impacts to Hydrology*

Cumulative impacts to hydrology under alternative #3 would be similar to those described under the proposed action, with the exception of impacts associated with filling the scour hole and the cofferdam blocking flow.

***Alternative #4- South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Hydrology*

Direct permanent impacts to hydrology from alternative #4 would be similar to those discussed under alternative #3. Alternative #4 also requires no filling of the scour holes existing within the IHNC.

As with the proposed action, alternative #4 would require a temporary braced cofferdam during construction installed in the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. As a result, temporary impacts to hydrology such as changes in velocity, water surface elevation, and circulation patterns, would be similar to the proposed action.

*Indirect Impacts to Hydrology*

Indirect impacts to hydrology would be similar to those described under the proposed action, however, the scour hole would not require filling. As with the proposed action, hydrologic changes resulting from implementation of alternative #4 may indirectly correlate to both temporary and permanent impacts to water quality and aquatic habitat. These impacts are discussed in further detail in sections 3.2.4 through 3.2.7.

*Cumulative Impacts to Hydrology*

Cumulative impacts to hydrology under alternative #4 would be similar to those described under the proposed action with the exception of impacts associated with filling the scour hole.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Hydrology*

Alternative #5 is the northern-most alignment and is the only alternative located within Lake Pontchartrain. This alternative would span the deepest portion of the northern scour hole and the lower portion of this scour hole would be partially filled. Velocities in the IHNC under alternative #5 would be expected to be similar to the proposed action.

Alternative #5 would cause the least amount of disruption of all alternatives considered during construction. Construction would be staged in Lake Pontchartrain so that flow between Lake Pontchartrain and the IHNC would not be completely blocked. Since flow would be maintained, the temporary impacts due to the cofferdam experienced with the proposed action would not be experienced with this alternative, however, the construction duration would be longer.

*Indirect Impacts to Hydrology*

Under alternative #5, flow would be maintained throughout the construction process; therefore, indirect impacts to DO and salinity would be less than the proposed action. However, the increase in overall construction duration would result in a longer timeframe in which the impacts would be experienced.

As with the proposed action, hydrologic changes resulting from implementation of alternative #5 may indirectly correlate to both temporary and permanent impacts to water quality and aquatic habitat. These impacts are discussed in further detail in sections 3.2.4 through 3.2.7.

*Cumulative Impacts to Hydrology*

Cumulative impacts to hydrology under alternative #5 would be similar to those described under the proposed action. Overall similar impacts would occur because the majority of changes such as reduced tidal amplitude are due to the implementation of the Borgne Barrier and the closure of the MRGO at Bayou La Loutre. Direct and indirect changes to the project area as discussed previously, along with the changes from the combination of IER and CWPPRA projects would lead to substantial long term cumulative impacts to the hydrology of the Lake Pontchartrain Basin and nearby vicinity. The implications of changes in circulation patterns, water surface elevations, and velocity to Aquatic Resources and Fisheries, EFH, and navigation are discussed in sections 3.2.4, 3.2.5, and 3.3.

### 3.2.2 Water Quality

Existing Conditions

The Tier 2 Pontchartrain project area falls within the Eastern Louisiana Coastal Watershed, USGS Cataloging Unit 08090203 (U.S. Environmental Protection Agency [USEPA] 2008). Watershed water quality is evaluated in several riverine, estuarine, and wetland/freshwater systems and is reported by the State of Louisiana for inclusion in the USEPA's National Assessment Database. State water quality assessments are typically based on five types of monitoring data: biological integrity, chemical, physical, habitat, and toxicity. The State of Louisiana's program consists of a fixed station long-term network, intensive surveys, special studies, and wastewater discharge compliance sampling (Louisiana Department of Environmental Quality [LaDEQ] 2006).

For Louisiana's 2006 Water Quality Integrated Report, the LaDEQ used the USEPA's Consolidated Assessment and Listing Methodology to designate water quality within their major water systems. Water quality within the Tier 2 Pontchartrain project area was given a rating of Integrated Report Category 1, indicating the water can support all primary contact, secondary contact, and fish and wildlife propagation uses (LaDEQ 2006). In the past, fish kills have been reported along the south shore of Lake Pontchartrain during the months of August and September, possibly due to low DO, high temperatures, and increased turbidity. Additional descriptions of the water resources within the project area can be found within section 3.2.4, Aquatic Resources and Fisheries.

Discussion of Impacts

Independent of the alternative, construction would temporarily increase turbidity from increased suspension of inorganic sediments. Construction activities would disturb the bottom and suspend inorganic sediments. Scour patterns around temporary structures, such as the cofferdam, may erode bottom material and suspend it in the water column. Best management practices (BMPs) would be employed to minimize the suspension of sediments and any potential turbidity effects. Nonetheless, suspended sediments could settle on the bottom a relatively short distance from the construction site where turbulence decreases and particles can settle. Areas of accumulated sediment would be relatively small and would not be expected to cause a measurable impact to waterbottoms in the project area.

Scour holes exist approximately 300 ft north and 300 ft south of the Seabrook Bridge (figure 7). These scour holes contain hypoxic water with relatively high salinity, up to 22 ppt. Changes in patterns of turbulence and scour caused by construction activities may force hypoxic, relatively saline water from the scour holes into the overlying water column. The temporal and geographic extent of possible impact from disturbance of the scour holes would depend on the degree of hypoxia and the amount of disturbance. If DO concentrations in the scour holes are near 0 mg/l, then hydrogen sulfide, which is toxic to aquatic organisms, could enter the water column along with low oxygen water. Rapid increases in salinity, accompanied by exposure to low oxygen levels and hydrogen sulfide may occur temporarily in the vicinity of the project. Dilution of water from the scour holes with overlying water is expected to limit effects of these conditions to the area around the construction site.

DO levels may be affected by construction activities in other ways; suspension of organic sediments from the bottom may create relatively small regions where oxygen concentrations drop below normal. Bacterial respiration associated with decomposition of organic sediments could decrease oxygen concentrations although dilution and re-aeration by physical mixing of the water would probably prevent oxygen levels from dropping below critical levels for aquatic life. Increased turbidity from suspension of both inorganic and organic sediments may reduce photosynthetic production of oxygen by floating and attached algae. Reduction in photosynthesis would not be expected to lower oxygen concentrations below critical concentrations. Additionally, suspension of chemically-reduced substances such as sulfides may lower oxygen concentrations through increased chemical oxygen demand (COD). Despite the variety of factors which may lower DO concentrations, it is believed those processes would not substantially lower oxygen levels beyond the area of construction. The scouring nature of flows through this portion of the IHNC suggests there is not likely to be substantial deposits of organic and inorganic sediments or concentrations of chemically reduced substances that could be moved into the water column by construction activities or resultant changes in scouring flows.

Turbidity caused by construction may slightly increase water temperature. Suspended particles near the surface absorb more solar energy than water molecules, resulting in warmer water near the surface than in less turbid water. Temperature increases overall would be slight and localized around the construction.

Due to expected hydrologic changes as described in section 3.2.1, impacts to salinity would be expected with implementation of the project. Salinities in Lake Pontchartrain would be expected to average 0.1 ppt to 0.3 ppt lower than if a barrier structure near Seabrook were not in place. Historical salinities in the vicinity of the proposed action (prior to the MRGO closure at Bayou La Loutre and the Borgne Barrier) range from approximately 6 ppt to 8 ppt depending on the season (USACE 2009d). The MRGO closure at La Loutre is modeled to decrease salinities within the project area on the order of 1.0 ppt to 3.0 ppt. To validate the decreases experienced as a result of the closure at La Loutre, the USGS is currently gathering field data which measures actual salinities at 10 ft below the surface along the MRGO and into the IHNC (USGS 2009). With the addition of the Borgne Barrier and the proposed action, additional decreases in salinity would be expected (as described later in this section).

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Water Quality*

Filling the scour hole south of the Seabrook Bridge may cause permanent beneficial changes to DO levels in the IHNC after construction is complete and has the potential to ultimately improve water quality conditions in the project area and nearby areas of Lake Pontchartrain (USACE 2009d). Possible long-term effects of the project on DO were modeled using a steady-state mass balance for a continuously-stirred tank reaction (CSTR). This modeling approach is commonly used for screening DO impacts associated with wastewater discharges in ponds, lakes, lagoons, bayous, and bays. It is a simplified approach that provides useful screening-level estimates of DO impacts. Surface water and bottom layer salinities were provided by the USACE ERDC and were used in the simulations (USACE 2009d). Long-term survey data from Lake Pontchartrain near the IHNC show DO and salinity gradients are greater in the scour holes near the IHNC and can persist as far as 8 miles north of the Seabrook Bridge. These gradients occur between 10 ft to 20 ft below the water surface and salinity can be as high as 22 ppt (USGS 2002b). Modeled DO values south of the proposed structures range from 1.9 mg/L to 2.5 mg/L with open channel flow through Seabrook. These values are below the standard for estuarine systems (4.0 mg/L).

To avoid the movement of sediments north into Lake Pontchartrain, the contractor would fill in the south scour hole and construct the cofferdam only during slack tide in the IHNC, when water is moving from Lake Pontchartrain into the IHNC. In addition, if possible with the flows experienced in the project area, the contractor would install and maintain a Type III silt barrier/curtain at a distance not to exceed 500 ft upstream and downstream from the point of discharge of the fill. The contractor would be required to take three readings per work day with a turbidity meter at locations not to exceed 500 ft upstream and downstream from the point of discharge to ensure that at no time is a difference in turbidity of 50 nephelometric turbidity units (NTU) exceeded.

The north scour hole would not be modified under the proposed action. This scour hole would continue to accumulate higher salinity water which would also become hypoxic as it does now. These high salinity/low oxygen conditions would continue to create a hypoxic zone along the bottom of a portion of Lake Pontchartrain near the IHNC. However the extent of this high salinity/low oxygen zone would be expected to be smaller than that created by alternatives #3 and #4 in which both scour holes would persist in their present condition.

During construction, a cofferdam would span the IHNC for approximately 6 months to 12 months. This would alter circulation patterns, salinities, and DO levels on the north and south sides of the cofferdam. The IHNC is ebb dominated and salinities directly north of the cofferdam may become slightly lower than the current levels, and conversely salinities south of the cofferdam would increase slightly over current levels. Modeling suggests that when flow through the IHNC is closed off (such as when the cofferdam is in place during construction or when the proposed structures are closed), higher DO values on the order of 4.0 mg/L to 4.2 mg/L can be expected south of the proposed structure. North of the proposed structure, closure of the channel would result in reduced DO values that range from 5.2 mg/L to 5.3 mg/L down to 4.1 mg/L to 4.2 mg/L (USACE 2009d).

*Indirect Impacts to Water Quality*

Although the proposed action is designed to allow for flows similar to those historically measured within the IHNC, boaters would have to navigate through the new sector gate where they could potentially encounter higher velocities and at times, more turbulent flow. These conditions would increase the risk for damage to occur to vessels that pass through the gates, which could result in fuel spills into the water. This may indirectly cause temporary impacts to water quality. The potential for these impacts to occur is lessened by the incorporation of design parameters that allow “safe” passage velocities, and navigational aids such as guidewalls, fendering, dolphins, and USCG signage.

*Cumulative Impacts to Water Quality*

The incremental effects of the proposed action would not be expected to have a significant long-term effect on large-scale water quality conditions in the study area since water quality would continue to be influenced by industrial and commercial uses. Concurrent construction of other 100-year HSDRRS projects could cause short-term impacts to water quality that could exceed the LaDEQ water quality standards. The cumulative construction impacts of the proposed action would be additive to similar impacts caused by other HSDRRS projects. The implementation of BMPs and Stormwater Pollution Prevention Plans (SWPPPs) would minimize cumulative impacts from construction.

Although the proposed action, when combined with the closure structures along the GIWW and Bayou Bienvenue indicate changes in DO and salinity values, the changes described would be minimal compared to the shift that has been measured due to the MRGO closure at Bayou La Loutre (USGS 2009). The MRGO closure at Bayou La Loutre could produce environmental benefits through partial restoration of estuarine salinity gradients. Modeling conducted by ERDC illustrated that the closure of the MRGO at Bayou La Loutre would have a significant effect on monthly average bottom salinity values not only in MRGO/GIWW/IHNC complex, but also in the Lake Pontchartrain area. Most areas would be expected to show decreases of 3 ppt to 4 ppt, with the MRGO channel showing the highest decrease in the region just north of the La Loutre closure at approximately 10 ppt (Martin et al. 2009b).

Continued industrial activities, urban wastewater discharges, and construction activities contribute to a continued decline in water quality within the study area. However, state and Federal programs are in place to regulate and improve water quality, so the net cumulative impact over time could be improvement of water quality for the study area.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to Water Quality*

Overall, direct impacts to water quality would be similar to those discussed under the proposed action. The south scour hole would be only partially filled in this alternative. This partial filling of the scour hole may result in the continued existence of a low DO/high salinity zone in the remaining portion of the scour hole.

*Indirect and Cumulative Impacts to Water Quality*

Indirect and cumulative impacts under alternative #2 would be the same as those discussed under the proposed action.

***Alternatives #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Water Quality*

Direct impacts under alternative #3 would be similar in part to those discussed under alternative #2. Low DO conditions may result from reduced physical aeration of the water. Low oxygen conditions can occur when localized rainfall runoff or other conditions substantially increase the load of oxygen-demanding materials to the IHNC without substantially increasing flushing. The Turning Basin and nearby portions of the IHNC may also be more susceptible to algal blooms during periods of reduced water exchange. Algal blooms can cause increased oxygen uptake as a result of increased algal respiration and bacterial decomposition of dying algae. These conditions might occur on either side of the project in the Turning Basin or IHNC.

Both scour holes are located north of the alternative #3 alignment and therefore neither scour hole would be modified. The scour holes would persist although the structure may prevent passage of the highest salinity waters at the bottom of the saltwater wedge past the project into Lake Pontchartrain. The scour holes could continue to accumulate higher salinity water which would also become hypoxic as it does now.

*Indirect and Cumulative Impacts to Water Quality*

Indirect and cumulative impacts under alternative #3 would be the same as those discussed under the proposed action.

***Alternative #4 - South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Water Quality*

Direct impacts under alternative #4 would be similar to those described for alternative #3.

*Indirect and Cumulative Impacts to Water Quality*

Indirect and cumulative impacts under alternative #4 would be similar to those described for the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Water Quality*

Direct impacts to water quality would be similar to those discussed under the proposed action. Unlike the proposed action, alternative #5 requires filling of the north scour hole and not the southern scour hole. Filling of the north scour hole in Lake Pontchartrain would occur in a less constricted area therefore the effects on water quality are expected to be less. Elimination of the north scour hole may reduce creation of high salinity/low oxygen waters in Lake Pontchartrain north of alternative #5.

The south scour hole would persist and may trap higher salinity water from the saltwater wedge. This higher salinity water may be more resistant to mixing because of increased density. Events that mix water from the south scour hole may create low oxygen/high hydrogen sulfide conditions in the upper water column which could stress or kill aquatic organisms in the IHNC.

*Indirect and Cumulative Impacts to Water Quality*

Indirect and cumulative impacts under alternative #5 would be similar to those described for the proposed action.

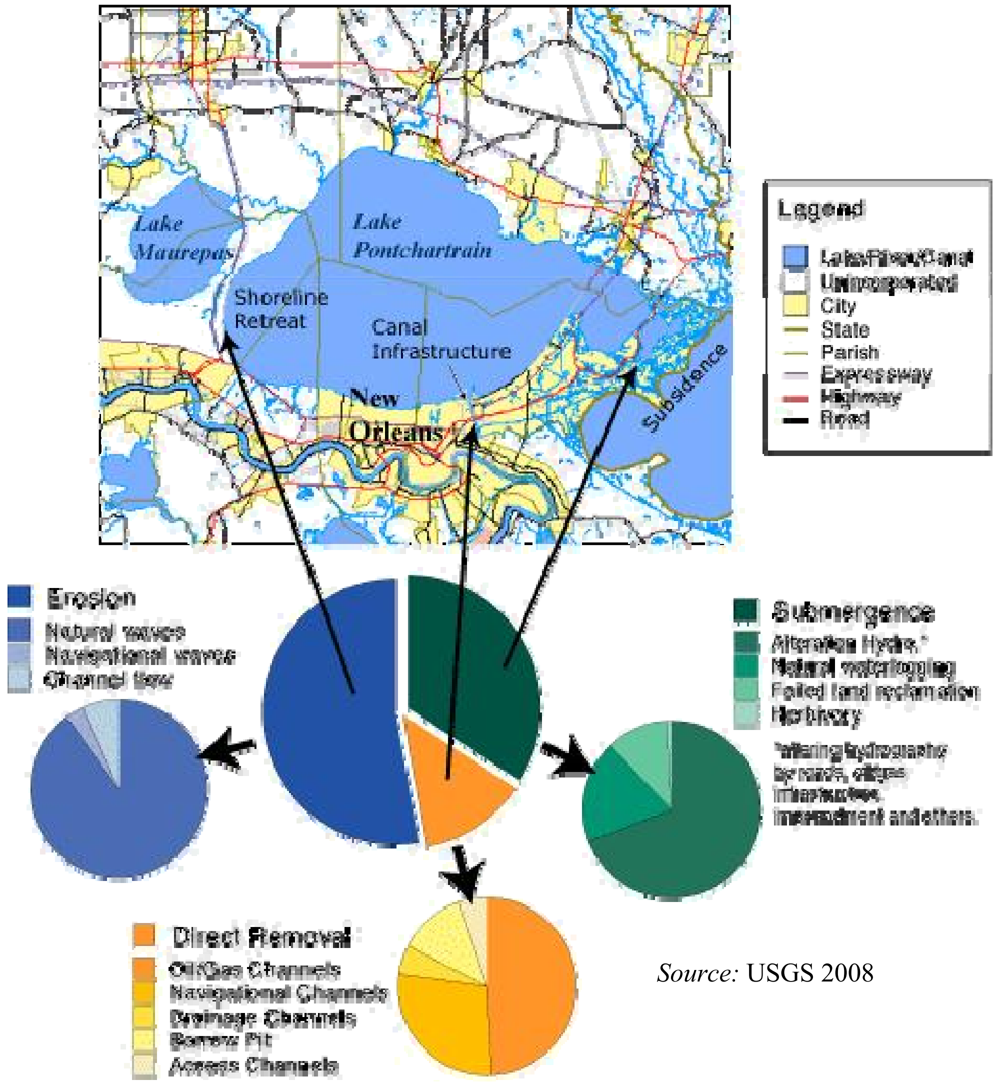
### 3.2.3 Wetlands

Existing Conditions

The Lake Pontchartrain Basin is a large, dynamic system consisting of Lake Pontchartrain and the areas along the GIWW and the IHNC near Lake Borgne. The area has been heavily altered for both flood control purposes and through the excavation of navigation canals. Land loss trends are represented in figure 27 (USGS 2008).

Coastal vegetation resources within the Lake Pontchartrain Basin formerly consisted of bottomland forest and freshwater/intermediate, brackish, and saline marshes. Historically, the influx of high volumes of freshwater from the Mississippi River system maintained predominantly freshwater/intermediate/brackish marshes in the study area. Changes in the extent of habitat types in the study area are a result of both biotic (living) and abiotic (non-living) forces. These forces, many related to the geophysical processes of deltas, are consistent across Louisiana's deltaic marshes. Natural subsidence and the development of human infrastructure are the main causes of a general decline of marsh and other wetland habitats (USACE 2007b).

Specifically, there is a continuing progression toward open water that is partially driven by constant subsidence of marsh. Human alteration of the landscape for risk reduction or navigation purposes can block the sediments associated with normal freshwater flow from entering the coastal marshes. Consequently, wetlands are not being replenished through the natural deltaic process (USACE 2004). In addition, steady population growth and land development over the past century continue to contribute to the shoreline and wetland loss currently experienced.




*Source:* USGS 2008

**Figure 27. Land Loss Trends within the Lake Pontchartrain Basin**

According to information provided in the Interagency Performance Evaluation Taskforce report, there is no indication flooding and subsequent floodwater pumping from greater New Orleans contributed to loss in delta, wetland, and/or Gulf of Mexico areas outside the city (USACE 2007c). Physical damage or alteration of habitats has a much greater impact to regional habitat and biological resources (USACE 2007c). These impacts include the loss of bottomland hardwoods and cypress-tupelo swamps to wind and storm surge damage and the intrusion of saltwater into previously freshwater/intermediate or brackish marshes initiated through breaches or overtopping of the levees (USACE 2007c).

The Lake Pontchartrain Basin consists primarily of three wetland marsh types: freshwater marsh, brackish-intermediate marsh, and salt marsh. Marshland type and distribution was determined for this study using Louisiana Department of Wildlife and Fisheries (LaDWF) data (LaDWF 2001). This data is part of the Louisiana GIS Digital Map, May 2007 Compilation DVD. The areas immediately adjacent to the IHNC within the Tier 2 Pontchartrain project boundaries are classified as Urban Developed land and contain no wetlands. Figure 28 illustrates the habitat types that currently exist within the Lake Pontchartrain Basin.

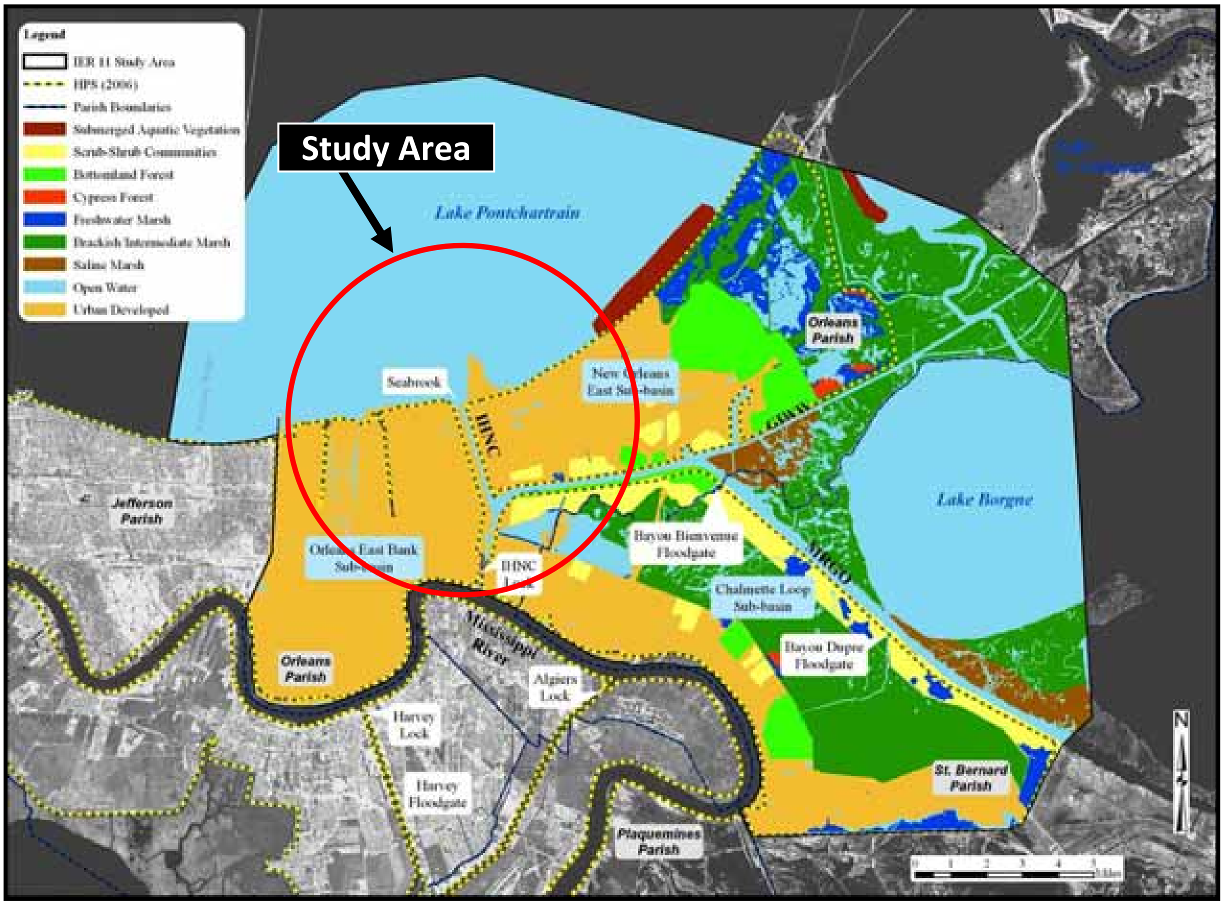



**Figure 28. Map of Habitat Types in the Study Area and Vicinity**

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Wetlands*

As illustrated in figure 28, the wetland habitat within the larger project area is primarily located in the area commonly referred to as the Golden Triangle, the marsh area bounded by the GIWW, MRGO, and Lake Borgne, and not within the immediate study area. For this reason no direct impacts to wetland habitat would be anticipated.

*Indirect Impacts to Wetlands*

No indirect impacts would be expected to occur under the proposed action due to the lack of existing wetland habitat in or around the project area.

*Cumulative Impacts to Wetlands*

As discussed in the IER #11 Tier 2 Borgne document, indirect impacts to marsh habitats within the Golden Triangle can be expected as a result of the alteration of water circulation and sediment processes caused by the combination of the MRGO closure at Bayou La Loutre, the

Borgne Barrier, and the proposed action (USACE 2008c). While the hydrologic connection is maintained through the proposed HSDRRS structures and modeled resulting flows would be similar to historical conditions, these openings do not fully replicate existing conditions. Modeling results indicate that the proposed action could result in altered hydrology and inundation levels which may indirectly contribute to the continued trend of marsh loss. While there is no marsh habitat within the immediate vicinity of the proposed action, hydraulic modeling of velocity magnitude and direction, water surface elevation, and overall circulation has shown that the changes that are initiated within the area of the GIWW by the closure of the MRGO at La Loutre and the construction of the Borgne Barrier continue with the addition of the proposed action although on a smaller scale (USACE 2009c). A more detailed discussion of the changes in hydrology can be found in section 3.2.1.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct and Indirect Impacts to Wetlands*

Alternative #2 is in close proximity to the alignment of the proposed action and contains similar project features. No direct or indirect impacts to wetland habitat would be anticipated due to a lack of existing wetlands in or around the project area.

*Cumulative Impacts to Wetlands*

While similar to the proposed action, alternative #2 requires only a partial fill of the southern scour hole resulting in a lesser impact to hydrologic changes within the IHNC and GIWW. This reduced impact equates to potentially a slight reduction in wetland inundation within the Golden Triangle Marsh area. A more detailed discussion of the changes in hydrology can be found in section 3.2.1.

***Alternatives #3 and #4 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls and South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Wetlands*

Direct, indirect, and cumulative impacts under alternatives #3 and #4 would be the same as those described for the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Wetlands*

Alternative #5 is located within Lake Pontchartrain and north of the alignment of the proposed action. Although this alignment would have greater impacts to open water habitat, no direct impacts to wetlands would be expected due to the lack of marsh habitat within the project area as depicted in figure 28.

*Indirect Impacts to Wetlands*

No indirect impacts under alternative #5 would be anticipated due to the lack of existing wetland habitat in or around the project area.

*Cumulative Impacts to Wetlands*

As discussed for the proposed action, with the construction of a new structure at Seabrook, indirect impacts to marsh habitats within the Golden Triangle would be expected as a result of the alteration of water circulation and sediment processes (USACE 2008c). Unlike the proposed action however, alternative #5 would not require filling of the south scour hole, which modeling has shown results in the greatest impacts to circulation patterns. A more detailed discussion of the changes in hydrology can be found in section 3.2.1.

### 3.2.4 Aquatic Resources and Fisheries

For the purposes of this section (3.2.4) and section 3.2.5 (EFH), the study area is a 5-mile radius circle with the center point located at the convergence of the IHNC and Lake Pontchartrain (figure 28). The project vicinity encompasses a much larger area including the Tier 2 Borgne Study Area (color area on figure 28). The project vicinity extends from the southern portion of Lake Pontchartrain, south to the MRGO closure at Bayou La Loutre, east to the Rigolets Pass, and includes the Golden Triangle Marsh, a portion of the GIWW, and the western lobe of Lake Borgne. The project vicinity is influenced by urbanized landscape, various canals, and armored embankments. It is also influenced to a lesser degree by the Bonnet Carré Spillway when the Mississippi River is in flood stage (O'Connell et al. 2004). Other influences on the project area in the IHNC and the GIWW are periodic dredging that causes impacts to existing water quality, and organisms, freshwater inflow from the Mississippi River Lock at the southern terminus of the IHNC, and freshwater inflow from numerous rivers in Lake Pontchartrain. Periodic dredging maintains these navigable waterways.

<u>Existing Conditions for Aquatic Resources</u>

Aquatic resources within the study area change yearly (due to El Niño Southern Oscillation and La Niña events), seasonally (water quality, hydrology, and weather), and daily (tides and freshwater inflow). Aquatic resources that occur within the project area include habitat (open water, benthic, and submerged aquatic vegetation [SAV]) and organisms (bivalves, crustaceans, phytoplankton, and fishes) that work together synergistically to cycle nutrients and food energy through the coastal ecosystem in Louisiana.

The project area consists of a portion of the IHNC from 1,800 ft north of the convergence with Lake Pontchartrain south to 2,500 ft south of the Seabrook Bridge. The areas of open water habitat in the project area were calculated and are presented in table 8.

**Table 8.**
**Permanent and Temporary Habitat Impacts from Proposed and Alternative Actions**

| Alternative/Nature of Area | Habitat Impacts (in acres) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Open Water Areas | | | | | Total Open Water | Upland (non-marsh) | TOTAL |
| | Lake Pontchartrain | IHNC main channel | Slip No. 6 | Barge Slip | Turning Basin | | | |
| **Proposed Action** | | | | | | | | |
| Permanent Floodwall / Gate ROW | | 6.9 | | | | 6.9 | 7.1 | **14** |
| Temporary Construction Easement | | | 2.5 | | | 2.5 | 9.5 | **12** |
| ***Total*** | | **6.9** | **2.5** | | | **9.4** | **16.6** | **26** |
| **Alternative # 2** | | | | | | | | |
| Permanent Floodwall / Gate ROW | | 4.3 | | | | 4.3 | 8 | **12.3** |
| Temporary Construction Easement | | 1.8 | 2.5 | | | 4.3 | 10.5 | **14.8** |
| ***Total*** | | **6.1** | **2.5** | | | **8.6** | **18.5** | **27.1** |
| **Alternative # 3** | | | | | | | | |
| Permanent Floodwall / Gate ROW | | 5.7 | 0.7 | 0.1 | 3.2 | 9.7 | 8.5 | **18.2** |
| Temporary Construction Easement | | | 2.5 | | | 2.5 | 9.5 | **12** |
| Raise Existing IHNC I-walls to T-walls | | | | | | | 6.9 | **6.9** |
| ***Total*** | | **5.7** | **3.2** | **0.1** | **3.2** | **12.2** | **24.9** | **37.1** |
| **Alternative # 4** | | | | | | | | |
| Permanent Floodwall / Gate ROW | | 5.8 | | | 1.2 | 7 | 7.5 | **14.5** |
| Temporary Construction Easement | | | 2.5 | | | 2.5 | 9.5 | **12** |
| Raise Existing IHNC I-walls to T-walls | | | | | | | 9.2 | **9.2** |
| ***Total*** | | **5.8** | **2.5** | | **1.2** | **9.5** | **26.2** | **35.7** |
| **Alternative # 5** | | | | | | | | |
| Permanent Floodwall / Gate ROW | 10 | 0.4 | | | | 10.4 | 2 | **12.4** |
| Temporary Construction Easement | 2 | 3.7 | 2.5 | | | 8.2 | 13.2 | **21.4** |
| ***Total*** | **12** | **4.1** | **2.5** | | | **18.6** | **15.2** | **33.8** |

Open water habitat in the study area consists of the IHNC, a man-made canal approximately 250 ft wide by 35 ft deep, and Lake Pontchartrain a 1,630 $km^2$ brackish estuary with an average depth of 11 ft (O'Connell et al. 2004). Other habitats and organisms in the study area discussed in the sections below are SAV, eastern oysters (*Crassostrea virginica*), common rangia (*Rangia cuneata*), and substrate under open water habitat. In addition to oysters and *Rangia* clams, mud crabs, blue crabs (*Callinectes sapidus*), shrimp, and other invertebrates are also discussed because they play an important role in the trophic system of Lake Pontchartrain.

The estuarine open water in the study area is influenced by diurnal tides (± 11 centimeters; Sikora and Kjerfve 1985) from two natural tidal passes on the east: the Rigolets and Chef Menteur Pass. Given the numerous past, ongoing, and authorized flood control projects in the vicinity of Tier 2 Pontchartrain, "existing conditions" is herein defined as conditions with the following structures in place: the MRGO closure structure at Bayou La Loutre and the Borgne Barrier. The Rigolets is flood-tide dominant, while the IHNC and Chef Menteur Pass are ebb-tide dominated (Sikora and Kjerfve 1985; figure 43).

Estuarine bottom habitat in the project area includes marsh deposits, subaqueous delta formations, limited amounts of offshore deposits, and hummus (Darnell 1961). Marsh deposits are the dominant type of sediment and consist of a mixture of very soft to soft organic clays and peat with some silt. Water quality of open water resources has been discussed in detail in section 3.2.2 and wetlands are discussed in section 3.2.3.

SAV is a diverse assembly of rooted macrophytes found in Lake Pontchartrain between water depths of 0.5 ft and 6 ft. SAV provides food and habitat for estuarine organisms and is an excellent indicator of water quality (USGS 2002c). There are four dominant species of SAV commonly found in Lake Pontchartrain; three freshwater species: Eurasian watermilfoil (*Myriophyllum spicatum*), wild celery (*Vallisneria americana*), and southern waternymph (*Najas guadalupensis*), and one primarily saltwater species: widgeon grass (*Ruppia maritima*) (Montz 1978).

Historically, wild celery has been the most dominant SAV species in Lake Pontchartrain, with widgeon grass being the second most dominant. In recent years widgeon grass has become dominant over wild celery. It is not known whether the increase in widgeon grass is a short-term response to a temporary drought or a long-term increase due to increased saltwater intrusion and changes to water quality. Figure 28 shows the distribution of SAV within the study area and the project vicinity. The area near Lincoln Beach appears to be the nearest occurrence of SAV to the project location. According to the USGS (2002c), an infrequent occurrence of SAV is located approximately 4.0 miles to the northeast of the project location. SAV does not occur in the footprint of the project area but does occur in the project vicinity.

Lake Pontchartrain and the IHNC play an important role in the cycling of nutrients and food energy through the coastal ecosystem in Louisiana. Autochthonous (originates from Lake Pontchartrain) and allochthonous (originates from outside Lake Pontchartrain) sources of detritus are the foundation of the trophic system. Food energy is transferred to higher trophic levels via phytoplankton, zooplankton, bivalves, crustaceans, and small fishes. Organisms comprising intermediate stages of the food web utilize habitats that occur within the project area such as open water, benthic, epibenthic, and nearshore areas. Balance of populations of zooplankton and phytoplankton is important for a healthy ecosystem or estuary. The dominant groups of phytoplankton are diatoms and dinoflagellates. These phytoplankton, along with green and blue-green algae, are responsible for naturally occurring large blooms in the study area waters, particularly in the summer when high temperatures and low turbidity stimulate their proliferation. Large phytoplankton blooms are also linked to nutrient-rich runoff from the developed and agricultural portions of the contributing watershed.

The dominant groups of zooplankton present in the study area include calanoid copepods, larval penaeid shrimp, and adult schizopods (Darnell 1961). Other species such as oysters and *Rangia* clams resemble plankton only in their early life stages and become sessile benthic organisms as adults. Zooplankton abundance varies with salinity and seasonal patterns of abundance have also been observed. The majority of plankton use flood-dominated tidal currents to enter Lake Pontchartrain through the Rigolets, wind driven currents to move throughout the estuary, and ebb-dominated tidal currents of the IHNC and Chef Menteur Pass to migrate back to the Gulf of Mexico.

Other important benthic species likely to occur in the study area are isopods, amphipods, chironomids, and mud crabs (*Rhithropanopeus harrisii*, *Neopanope texana*, and *Panopeus herbstii*), serpulid worms (polychaetes), gastropods such as the oyster drill (*Stramonita haemastoma*), and the moon snail (*Euspira lewisii*). Economically important crustacean species that occur throughout the project area include blue crabs, brown shrimp (*Farfantepenaeus aztecus),* and white shrimp (*Litopenaeus setiferus).* Other common invertebrates that occur within the project area on hard surfaces are *Rangia* clams and oysters (Hoese and Moore 1998). Many of these species are dominant food items in the diet of fish, including sciaenids, flounder, and other large marine fishes such as grouper and snapper.

Three major passes, the Rigolets, Chef Menteur Pass, and the IHNC are used by plankton, macroinvertebrates and fishes to migrate into and out of Lake Pontchartrain. Larval and post larval life stages of some species (such as blue crab, several drum species, and shrimp) use flood tides to migrate into Lake Pontchartrain through these three passes. A previous assessment of macroplankton (i.e. larval fishes and crustaceans) movement through these passes determined there was no significant difference in unit catch between the passes and concluded that migration through the passes was necessary to maintain the populations in Lake Pontchartrain (Fannaly 1979). Swenson and Chaung (1983) conducted studies on water volume exchange in estuarine systems and found that the Rigolets is primarily flood-dominated whereas Chef Menteur Pass and the IHNC are primarily ebb-dominated. These findings are supported by the Hydrodynamic Validation modeling which found that under existing conditions velocities of ebb tides in the IHNC ranged from about 3 fps to 6 fps versus flood tides which ranged from about 0 fps to 1 fps (validation modeling data was only looked at for one 24-hour period in October 2008 and that no data was collected during peak flow conditions; USACE 2009c).

## Existing Conditions for Fisheries

### *Recreational and Commercial Fisheries*

Recreational and commercial fisheries are considered a vital part of Louisiana's economy. In 2006, two of the top commercial fishing ports in the U.S. were in Louisiana (NOAA 2006), and over 33 percent of commercial fish harvested in the lower 48 states came from the Louisiana coastal zone (Coalition to Restore Coastal Louisiana [CRCL] 2000). The landings of all the fisheries species combined in the State of Louisiana for 2005, 2006, and 2007 are shown in table 9, including finfish, shrimp, crabs, and benthic fauna such as clams and oysters.

**Table 9.**
**Annual Landing Statistics for all Fisheries Species Combined for the State of Louisiana, 2005 – 2007**

| Year | Metric Tons | Pounds | Value ($) |
|---|---|---|---|
| **2005** | 385,231 | 849,280,372 | 251,687,265 |
| **2006** | 416,628 | 918,498,167 | 278,111,830 |
| **2007** | 452,382 | 997,322,084 | 286,954,135 |
| **Grand Totals** | 1,254,241 | 2,765,100,623 | 816,753,230 |

*Source:* NOAA 2007.

These species fill a variety of ecological niches and support commercial and recreational harvests either directly (in the form of takes) or by providing prey for harvested species. Movement between fresher and more saline waters is essential to the life history of many of these species. Some marine species have increased in abundance following hurricanes, perhaps due to a decrease in fishing effort. For example, trawl surveys conducted in the fall of 2005 (after Hurricanes Katrina and Rita) found no indication of reductions in offshore fish or shrimp populations and no evidence of fish kills (for saltwater species). In fact, trawl catches of certain species averaged 30 percent greater than average pre-Katrina catches (USACE 2006b).

Waters of the project area occur in the Lake Pontchartrain Basin. As previously discussed, two natural tidal passes (Chef Menteur Pass and The Rigolets) currently serve as major pathways between the Gulf of Mexico and Lake Pontchartrain. They act as migration routes to and from the Gulf of Mexico, connecting spawning and nursery grounds for species such as the blue crab, red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), and spotted seatrout (*Cynoscion nebulosus*). These routes are necessary to these species to complete their life cycle, particularly given that each of these species is an important component to recreational or commercial fisheries in Southeast Louisiana.

Recreational fisheries accounted for $194.9 million in revenue (including recreational boating) for Louisiana statewide during 2006 (LaDWF 2008). The five fish species most encountered during recreational fishing in Louisiana are the red drum, black drum, spotted seatrout, Atlantic croaker (*Micropogonias undulatus*), and sand seatrout (*Cynoscion arenarius*) (Pattillo et al. 1997). Other important sport fish species of fresh to slightly brackish waters include the black crappie (*Pomoxis nigromaculatus*), white crappie (*Pomoxis annularis*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), largemouth bass (*Micropterus salmoides*), spotted sunfish (*Lepomis punctatus*), yellow bass (*Morone mississippiensis*), channel catfish (*Ictalurus punctatus*), and Gulf menhaden (*Brevoortia patronus*) (USACE 1984). Although not encountered during fishing directly, bay anchovy (*Anchoa mitchilli*) are the most abundant fish in Lake Pontchartrain and serve an important ecological function as a prey species and supports the fish mentioned previously (O'Connell et al. 2004). Although recreational fishing occurs within all portions of the IHNC, the Seabrook area is anecdotally reported to be the second best fishing site in Louisiana (refer to Section 3.2.10 for additional information).

Economically important commercial fisheries exist within Lake Pontchartrain for brown shrimp, white shrimp, and blue crab. Lake Pontchartrain is classified by the LaDWF as an un-leased state water bottom, and therefore, harvesting oysters is illegal (LaDWF 2009b). However, oysters do occur in Lake Pontchartrain and on hard surfaces (riprap, pilings, and guidewalls) in the project area. Commercial catches of catfish, drum, buffalo (*Ictiobus* spp.), and alligator gar (*Atractosteus spatula*) are confined to fresher waters (USACE 1984). Table 10 lists the commercially and recreationally important fishes grouped by fishery classification and the statewide value for each group.

**Table 10.**
**State-wide Dollar Value of Representative Game and Commercial Fisheries Species Occurring in or near the Tier 2 Pontchartrain Project Area**

| Common Name | Scientific Name | Value in 2007 Dollars ($) |
|---|---|---|
| **Marine Species** | | |
| Brown shrimp | *Farfantepenaeus aztecus* | 43,303,937 |
| White shrimp | *Litopenaeus setiferus* | 94,074,290 |
| Pink shrimp | *Farfantepenaeus duorarum* | 28,342 |
| Tarpon | *Megalops atlanticus* | -- |
| Atlantic croaker | *Micropogonias undulatus* | 54,662 |
| Red drum | *Sciaenops ocellatus* | -- |
| Black drum | *Pogonias cromis* | 1,785,663 |
| Gafftopsail catfish | *Bagre marinus* | -- |
| Seatrout | *Cynoscion* sp. | 26,051 |
| Sheepshead | *Archosargus probatocephalus* | 266,959 |
| Southern flounder | *Paralichthys lethostigma* | 109,689 |
| Striped mullet | *Mugil cephalus* | 685,585 |
| Gulf menhaden | *Brevoortia patronus* | 41,367,977 |
| Herrings | Clupeiformes | 172,285 |
| Sea catfish | *Arius felis* | -- |
| Atlantic rangia | *Rangia cuneata* | -- |
| Eastern oyster | *Crassostrea virginica* | 40,135,806 |
| Blue crab | *Callinectes sapidus* | 34,801,488 |
| **Freshwater Species** | | |
| Alligator gar | *Atractosteus spatula* | 598,068 |
| Catfish | *Ictalurus* sp. | 2,213,170 |
| Flathead catfish | *Pylodictis olivaris* | 140,889 |
| Gizzard shad | *Dorosoma cepedianum* | 134,126 |
| Buffalo | *Ictiobus* sp. | 728,919 |
| Threadfin shad | *Dorosoma petenense* | -- |
| Bass | *Micropterus* sp. and *Morone* sp. | -- |
| Temperate bass | *Morone* sp. | -- |
| Crappie | *Pomoxis* spp. | -- |
| Freshwater drum | *Aplodinotus grunniens* | 77,268 |
| Sunfishes | *Lepomis* sp. | -- |

*Source:* Gulf States Marine Fisheries Commission (GSMFC) 2009.
-- = data unavailable.

*Brown and White shrimp*

In 2007, the two most commercially valuable fisheries species in Louisiana were brown and white shrimp (table 10). NOAA's National Marine Fisheries Service (NMFS) annual shrimp landing data from 1988 to 2000 documents brown shrimp landings continually exceed those of white shrimp in the combined areas of Lake Pontchartrain. With the exception of 1985, which showed exceptionally high landings of brown shrimp, peak landings of brown shrimp and white shrimp were similar to those observed in the 1970s. Life history strategies and habitat preferences of brown and white shrimp are described in section 3.2.6.

*Blue crab*

The Gulf of Mexico is responsible for a considerable percentage of the nation's blue crab landings. In the 1990s, the Gulf of Mexico produced 29 percent of the commercial and recreational harvest of blue crabs in the U.S. In Louisiana, blue crab landings were consistently higher than any other Gulf of Mexico state representing 72.2 percent of the total Gulf of Mexico production in 1993. An annual average of 44.2 million pounds was valued at $22.4 million. The state also led the nation in blue crab landings in 1987, 1988, 1991 (Guillory and Perret 1998), and 2002. More recently in 2007, Louisiana produced a total of 44.8 million pounds of blue crab valued at $34.3 million (GSMFC 2009).

In general, there has been a decline in blue crab abundance. The decline in legal-sized crabs (50 centimeters [cm] has been linked to excessive fishing pressure on larger individuals or "gross over fishing" (Hammerschmidt et al. 1998), while the decline of early life stage crabs and juveniles is associated with high predation rates in the northern Gulf of Mexico estuaries and more importantly the loss of valuable nursery habitat as Louisiana continues to experience accelerated rates of coastal land loss (Boesch et al. 1994; Duffy 1989; Guillory 1997; Perry et al. 1998; Rabalais et al. 1995).

Blue crab is an important commercial species for Lake Pontchartrain spending the majority of its life migrating throughout the entire estuary (estuarine-dependent) to complete its life cycle. Wind-driven currents and the presence of adequate habitat are the driving forces behind abundance and life stages of blue crabs in a given region of the estuary at a given season (Lyncker 2008). They inhabit salinity ranges from 0 ppt to nearly 35 ppt. Temperature is another important factor throughout the life of a blue crab, because growth of the species is regulated by water temperature. Growth through molting of the exoskeleton (outer shell) occurs when water temperatures are greater than 59°F. However, water temperatures above 91°F are lethal (USACE 2004). When air temperatures drop below 50°F, males and immature females will bury themselves and remain in a state of torpor throughout the winter, while mature female crabs will leave the shallow, inshore waters and seek higher saline, warmer waters. This migration of mature female crabs, during which they travel considerable distances over just a few days to reach the higher salinity, is also a migration towards spawning areas. Female blue crabs will use tidal transport to migrate down the estuary towards the Gulf of Mexico during fall months to spawn (Perry et al. 1998).

Female crabs release larvae into the higher saline waters to be transported out over the continental shelf where larvae will undergo various stages of development. Early life stage crabs then use tidal transport to migrate from offshore to upper estuarine, lower saline, protective, benthic habitat such as internal marsh areas, the marsh edge, and SAV in Lake Pontchartrain (Perry et al. 1998). Welch et al. (1999) found that megalopae use exogenous cues (turbulence and salinity) to detect flood tides and ascend into the water column and utilize water movement to migrate to the upper estuary. Early life stage blue crabs are transported into the estuary two times throughout the year (early summer and fall) to settle in suitable, protective habitat near the migration corridors and inlets to the estuarine system (Etherington and Eggleston 2000). During a 12-month study of blue crab migration, blue crabs migrated into Lake Pontchartrain specifically from May to June through the IHNC (Lyncker 2008) during nocturnal flood tides (Welch et al. 1999). In September and October, blue crabs entered Lake Pontchartrain via The Rigolets and Chef Menteur Pass (Lyncker 2008). Juvenile and sub-adult crabs move from dense vegetation into the open water, lower saline areas of the upper estuary containing unstructured habitat (Pile et al. 1996). Once adults, female blue crabs migrate to the Gulf of Mexico where they will reach sexual maturity at 10 months to 12 months old (Guillory 1997).

*Atlantic croaker*

The Atlantic croaker is an estuarine-dependent species, meaning it migrates throughout the entire estuary during various stages of its life cycle. This species inhabits emergent marsh habitats as a juvenile and deep coastal habitat near passes and channels as an adult (Lassuy 1983a). Spawning typically takes place between October and February, with a peak in spawning occurring in December in the central Gulf of Mexico (Louisiana, Mississippi, and Alabama). Croakers typically spend their first two years in the estuary before migrating back to deeper water. Atlantic croaker grow at faster rates in mesohaline habitats (5 ppt to 18 ppt) and are found at higher densities in marsh edge habitats (Weber 2004).

According to Pattillo et al. (1997), all life history stages of this species are abundant in Lake Pontchartrain. There is a high probability of sub-adult and adult Atlantic croaker occurring in the open water habitat with the soft-bottomed substrates it prefers (Lassuy 1983a) commonly found within the project area. Juvenile Atlantic croaker are also associated with emergent marsh habitats over silt/mud or oyster shell substrate, and there is a high probability of occurrence in tidally-flooded marshes (Weber 2004).

Atlantic croaker is one of the most widely encountered fish during commercial and recreational fishing. The adult fish are often caught for consumption while the juveniles and sub-adults are used for live bait to catch trophy-size spotted seatrout.

*Black drum*

The black drum is an estuarine-dependent species which spawns in nearshore habitats and passes between November and May. Juveniles prefer non-vegetated habitats with muddy substrate, and adults occur over non-vegetated sand, mud habitats, and over oyster reefs. The open water habitats that occur within the project area have characteristics similar to those preferred by juvenile black drum (i.e., non-vegetated, muddy, open water), and they are considered common as juveniles in the project area. Adult black drum may also occur in non-vegetated habitat all year round in the project area (Pattillo et al. 1997).

*Sand seatrout*

The sand seatrout is an estuarine resident species that occurs throughout the Gulf of Mexico in nearshore habitats (Pattillo et al. 1997). It spawns primarily in shallow, higher salinity habitats (Sutter and McIlwain 1987) between February and October (Ditty et al. 1988). Juvenile sand seatrout typically prefer habitats such as flooded marshes and seagrass meadows with soft organic substrates (Benson 1982). Adults are found in open water over most substrate types (Pattillo et al. 1997). Juveniles typically inhabit flooded estuarine marshes of the project area between June and September (Pattillo et al. 1997). Pattillo et al. (1997) consider juvenile sand seatrout to be abundant in Lake Pontchartrain. Adults are common from May through September.

*Spotted seatrout*

Spotted seatrout are estuarine residents, spending their entire life cycle in estuarine waters. Spawning typically occurs from March to October, with a peak between April and August (Ditty et al. 1988). Spawning takes place in passes, as well as in shallow, grassy areas in bays with moderate salinities. Spotted seatrout larvae appear to use currents to travel into marsh habitats. Larvae originally found offshore travel west from spawning locations (Shaw et al. 1982). Spotted seatrout feed on zooplankton as larvae, larger invertebrates and small fish as juveniles, and primarily fish as adults (Pattillo et al. 1997). Juvenile and adult spotted seatrout are common throughout the project area with adults being more abundant during spring and early summer, and abundance peaking during late summer and early fall for juveniles (Pattillo et al. 1997).

*Gulf menhaden*

The Gulf menhaden support the largest single fishery (by weight) in the U.S., and their young are prey to many other species of sport or commercial importance. The maintenance of large parcels of surrounding marsh and of inflowing freshwater tributary systems is considered necessary to sustain suitable habitat for supporting menhaden populations in estuaries. The eastern half of Lake Pontchartrain is included in the coastal distribution of this species (Lassuy 1983b).

*Bay anchovy*

The bay anchovy is the predominant fish species (by mass) in Lake Pontchartrain. It is considered a prey species for many commercially and recreationally important species such as red drum, spotted seatrout, and sand seatrout. Bay anchovies spawn year round in estuarine waters where salinity is greater than 10 ppt (Robinette 1983). The pelagic eggs of the bay anchovy are found throughout the water column but tend to be concentrated near the surface, in salinities of 8 ppt to 15 ppt (Morton 1989). Bay anchovy feed on copepod nauplii and copepodids. Mass starvation of bay anchovy larvae occurs at low food concentrations, which occurs mostly in subtropical marine ecosystems if the larvae do not encounter a "patch" of suitable food (Morton 1989). The "critical period" during which these larvae must feed was determined to be within 2.5 days after hatching. Robinette (1983) found that bay anchovy larvae were most susceptible to starvation mortality during the first 6 days after hatching. Larval bay anchovies may require high and stable prey densities to survive and grow under natural conditions. At low prey concentrations, larval bay anchovies may be required to expend a relatively large amount of energy to obtain the minimum amount of food required for growth and maintenance, and would therefore, be susceptible to starvation and predation (Leak and Houde 1987). Adults primarily feed on mysids, copepods, rotifers, detritus, macrozooplankton, small shrimp, and larval fishes (Robinette 1983). Larger specimens consume an array of benthic crustaceans, especially amphipods, mysids, harpacticoid copepods, ostracods, and small mollusks. Bay anchovy eggs and larvae accounted for 96 percent and 88 percent, respectively, of all ichthyoplankton eggs and larvae collected in the lower Chesapeake Bay between 1971 and 1976. Data revealed peaks in bay anchovy egg abundance between May and August, and peaks of larvae between July and August (Morton 1989).

Bay anchovy is the primary forage item for many economically important predators and is an important link in the estuarine food web. The bay anchovy tolerates a wide range of temperatures and salinity has little influence on its distribution. Adult bay anchovy inhabit shallow to moderately deep waters and are found in a variety of habitats in nearshore and offshore waters. Bay anchovies appear to show little preference for habitat type as they regularly occupy open bays to small muddy coves; beaches to the mouths of rivers; and small bayous to seagrass beds in freshwater rivers (Morton 1989). In the Chesapeake, densities were highest in salinities of 4.2 ppt to 6.0 ppt, or shortly after the time of maximum water temperature (Morton 1989). Mature bay anchovies move downstream to spawn when water temperatures reach at least 12 degrees Celsius ($^{o}$C) and salinities are generally 10 ppt or greater (Robinette 1983). Newly hatched larvae then move upstream to waters of less than 10 ppt salinity to feed. Larval and juvenile bay anchovies begin to move into more saline waters in early fall. By late November, anchovies occur only in saltwater. Schultz et al. (2003) found the smallest larvae in the lower portions of the river and lower estuary, while larger larvae were more concentrated in upriver/ upper estuary sections. Anchovies were more concentrated at deeper depths where they are able to use upstream residual flow to promote movement up stream or up estuary. Bay anchovy are thought to use depth preferences (vertical movement) and neap tides to rapidly move toward the upper estuary to feed.

*Oysters and Rangia Clams*

Eastern oysters are sessile bivalves that occur throughout the Gulf of Mexico in shallow bays, mud flats, and offshore sandy bars (Stanley and Sellers 1986). Oysters grow well on a variety of substrates ranging from rocky bottoms to some type of mud. Oysters also depend on currents to deliver food, remove feces, and prevent burial. The presence and growth of oysters are closely correlated to salinity and other abiotic variables. According to Pattillo et al. (1997), salinity, DO, and pH may affect the locations where oysters occur and thrive. DO concentrations ranging from 7.41 mg/L to 8.62 mg/L, pH ranging from 8.23 to 8.78, and salinity levels ranging from 21.43 ppt to 21.93 ppt are the preferred habitat conditions for this species.

Harvesting oysters is illegal in Lake Pontchartrain, but anecdotal information suggests that scattered populations of eastern oysters occur in Lake Pontchartrain and in the project area near the convergence of the IHNC on man-made structures (LaDWF 2009a). Lyncker (2008) also mentions oysters in the northeast region of Lake Pontchartrain near Goose Point.

*Rangia* clams are those found embedded in the mud bottom throughout the lake. These organisms are responsible for purifying the lake water. *Rangia* clams are more abundant throughout the estuary than oysters, occurring over soft mud and sand substrate adjacent to emergent vegetation and SAV throughout the lake (Lyncker 2008). *Rangia* clams are present along Pontchartrain Beach in sand substrate mixed with pebbles and detritus (Lyncker 2008). Additional information about the role of *Rangia* clams in the ecology of Lake Pontchartrain and how it pertains to EFH is discussed in sections 3.2.5.

*Larval Prey Transport for Fisheries Resources*

Extensive research on larval transport and fish migration has been conducted on the east coast for species that also occur in Lake Pontchartrain. When possible, research from Lake Pontchartrain and nearby estuaries on the Gulf of Mexico has been used to draw conclusions about the impacts of the proposed action, but where data gaps exist for southern Louisiana, research conducted in estuaries such as Chesapeake Bay has been used. Although these studies were not conducted in Lake Pontchartrain, similar cues and processes are expected to occur in Lake Pontchartrain because both estuaries contain some of the same or similar species and have similar abiotic and biotic conditions. The following paragraph describes work that has been conducted in Chesapeake Bay.

Larvae are capable of using internal cues (hormonal, behavioral or biological) and/or external cues (environmental) that transport them to the tidal prism of the estuary and to nursery areas. An example of an internal cue is vertical migration that coincides with flood tides or residual bottom inflow. External cues are active movements toward an area of the water column when an organism detects changes in wind forcing, turbulence, and/or salinity. Hare et al. (2005) found that a combination of wind forcing, residual bottom inflow, and selective tidal stream transport is responsible for the ingress of larval fishes into the Chesapeake Bay, and that the relative importance of the three mechanisms differs among species and changes with larval development. All three mechanisms of ingress contributed to the net up-estuary flux of larvae, but tidal mechanisms become more important for larger organisms. Net up-estuary flux is defined as movement from one habitat (usually offshore) toward the upper estuary or the location where freshwater flows into the estuary. Net movement up-estuary of the Atlantic menhaden (*Brevoortia tyrannus)* was dominated by residual bottom inflow and wind forcing. Ingress of the summer flounder (*Paralichthys dentatus)* was dominated by tidal mechanisms, and the importance of tides increased with developmental stage. Schultz et al. (2003) found that residual bottom flow was also important in the ingress of bay anchovy and Welch et al. (1999) found that blue crabs primarily use turbulence and salinity as cues to determine when flood and slack tides occur. Spotted seatrout appear to use currents to move into marsh habitats in estuaries.

Discussion of Impacts

Aquatic resources and fisheries rely on a combination of favorable abiotic (salinity, temperature, turbidity, and DO) and biotic (protection from predators and food availability) characteristics that are necessary for survival, growth, and reproduction in order to maintain the synergy of the ecosystem (Peterson 2003). The assessment of potential impacts to aquatic resources and fisheries resources is based on scientific literature and modeling of water quality (DO and salinity), velocity, fish passage, as well as particle tracking modeling (PTM) for eight larval organisms with three general behavior characteristics (brown shrimp, white shrimp, blue crab, bay anchovy, Gulf menhaden, Atlantic croaker, red drum, and spotted seatrout) in the project area. Larval organisms were used in the modeling because there is insufficient data available on the behavior of juvenile and fully grown organisms and larval organisms behave in a much simpler manner and can therefore be modeled with certain native tendencies (USACE 2009c).

This discussion describes in detail how the proposed action would cause relative changes in the project area. Impacts from alternatives #2 through #5 will be discussed in relation to the various alternatives and to other associated projects in the project vicinity.

Temporary and permanent impacts to aquatic resources and fisheries that will be discussed, when applicable, under the standard subheadings of direct, indirect, and cumulative impacts include:

- Direct impacts to estuarine open water and estuarine substrate;
- Direct impacts to the bathymetry of the IHNC;
- Effects on migratory movements;
- Impacts on active and passive transport of eggs and larvae;
- Impacts to water characteristics (temperature, salinity, turbidity, DO);
- Access of organisms to suitable abiotic (temperature, salinity, turbidity and DO) and biotic (predator-prey interactions and marsh edge) habitat;
- Incidental mortality of some fish and prey species specifically during construction activities; and
- Alterations to hydrology, tidal prism, and velocity.

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Aquatic Resources and Fisheries*

Under the proposed action, estuarine open water and benthic habitat would be directly impacted by the footprint of the sector gate, two lift gates, and associated floodwall tie-ins. During construction, approximately 2.5 acres of open water would be temporarily impacted by the cofferdam structure, construction easements, and staging areas. Approximately 7 acres of open water and waterbottoms would be expected to be permanently lost to the new flood control structures at Seabrook (table 8). The proposed action would not be expected to have any direct impacts to SAV.

Even though the IHNC is an artificial channel with bulkheads along the shoreline and has been previously dredged to maintain the navigable waterway, it currently serves as a major conduit between the Gulf of Mexico and Lake Pontchartrain for many aquatic resource species. Significant alterations to this conduit could cause positive and negative impacts to multiple benthic and pelagic species including *Rangia* clam, fish, shrimps, and crabs because mechanisms that drive transport/migration patterns would be altered.

Mobile organisms (e.g. shrimp, crab, and fish) may have a longer travel time to reach appropriate salinities which support the habitats where suitable prey items may be found. However, migrating species may use salinity gradients and tidal flow to sense direction to the Gulf. These species may make a smoother transition into and out of the lake, through Chef Menteur Pass and The Rigolets, provided there are suitable prey items and habitat to sustain the additional individuals using this area. Once construction of the proposed action is complete the Seabrook gates would allow aquatic resources and fisheries into and out of Lake Pontchartrain except during storm events, such as the 100-year storm level high flow event, necessary closures to prevent excessive velocities, and monthly OMRR&R (discussed in section 1.6). These infrequent closure events would not likely last longer than a few days and should have a minimal effect on migration and transport of aquatic resources and fisheries.

Although certain construction activities, particularly those associated with the cofferdam, could result in mortality of individuals that are considered aquatic resources and fisheries resources, the number affected by the proposed alignment is not expected to impact invertebrate and vertebrate populations. Most individuals would be expected to move away from the impacted area. Eggs, larvae, and juvenile fisheries species may experience greater impacts than adults because it takes smaller organisms more energy to travel the same distance as larger, adult organisms. Sessile organisms may be impacted more than motile ones. All invertebrate life stages could potentially be more greatly impacted than adult fishes because of the greater travel time required for most small organisms to move through the project area. Although these impacts would be temporary, they could occur during the entire construction period (approximately 36 months).

During construction a braced cofferdam would be temporarily installed across the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. During this phase of construction, the IHNC would be closed to flow exchange with Lake Pontchartrain.

While the cofferdam is in place movement and transport of organisms between the IHNC and Lake Pontchartrain would be temporarily blocked. The duration of this construction phase would impact at least one spawning season of most species since larvae and juveniles moving along the GIWW and Bayou Bienvenue/MRGO north of the Bayou Bienvenue closure would be unable to enter Lake Pontchartrain through the IHNC. The life cycle of these organisms depends on reaching the lower salinity waters of Lake Pontchartrain and various habitat types in the lake. Although two conduits (Chef Menteur Pass and the Rigolets) would remain open and organisms could use these as routes to reach nursery areas in the lake, those individuals transported to the INHC during this time would mostly likely be unable to travel against the directional flow through the GIWW toward Chef Menteur Pass or the Rigolets. Larvae would most likely not recruit to Lake Pontchartrain nursery areas during this construction phase. Conversely, the cofferdam could also concentrate prey items, thus attracting larger fish/predators to the area; however, the expected poor water quality in the vicinity of the cofferdam may negate fish from taking advantage of this opportunity.

Closure of the IHNC while the cofferdam is in place may cause larvae, juveniles, and adult stages of some species to become unable to exit the IHNC and find an alternate route to a suitable supply of food, potentially resulting in starvation or heightened predation. These dietary and behavioral impacts could cause decreases in populations of lower trophic level species, and in turn, the species that rely on them entering Lake Pontchartrain. Influx of blue crab larvae through the IHNC would be disrupted by the cofferdam placement (approximately 6 months to 12 months), which could overlap with at least two breeding cycles of this species.

Temporary, but potentially lethal disturbance would also occur as the area inside the cofferdam (approximately 95,000 sq ft) is dewatered. This construction activity may cause mortality to individuals trapped in the cofferdam. Also, depending on the time necessary to construct the cofferdam, the environment inside the cofferdam may become anoxic before the area is dewatered causing mortality to the majority of organisms inside. Similar impacts may occur after the placement of retaining walls for the T-walls after the cofferdam is in place as a result of blocking water behind the sheet piles before fill is placed to construct the T-wall. Additionally, placement of riprap outside the retaining walls would also likely cause burial of some individuals.

Under the proposed action a scour hole (figure 7) would have to be filled prior to construction of the new flood control alignment. During these construction activities there is a potential for burial and/or suffocation of benthic organisms such as polychaetes, oysters, and *Rangia* clams that occur in the footprint. Mobile organisms such as shrimp, fish, and crab are expected to move from the area but still have the potential of being buried. Impacts from suffocation and burial would only occur during filling activities; however impacts would be temporary and benthic communities would be expected to rapidly recolonize (Montagna et al. 1998).

Localized mortality of some individuals may occur as a result of the filling of the scour hole in the IHNC associated with construction of the proposed action. Filling in the hole would decrease the area of deep water and bottom habitat available to aquatic resources and fisheries. Sessile organisms would incur a greater impact than motile ones; however, few sessile organisms are likely to occur in the scour hole. Deep water habitat is sparse in the study area; however, another scour hole exists just north of the Seabrook Bridge (figure 7). It is expected that fish and other motile benthic organisms displaced from the scour hole by construction would move to the northern scour hole.

Noise and vibration from construction activities would most likely deter many organisms, including predatory fish, from the project area while construction activities are carried out each day. Sessile benthic organisms that reside in the project area, and cannot remove themselves from noise and vibration would be impacted. These negative impacts could range from stress that prevents them from feeding, to death from cracked shells caused by vibration. Noise occurring from construction activities could cause behavioral changes and sub-lethal impairments to the hearing of mobile organisms (including some aquatic resources and fisheries; Hastings and Popper 2005).

After the proposed action is constructed, flow through the IHNC at Seabrook would be narrowed from 250 ft to three openings that total approximately 195 ft in width. Although the width of the channel is reduced, design of the gate structures provides a 3,000 sq ft to 3,500 sq ft flow area, which hydraulic modeling has indicated results in velocities similar to those experienced historically within the IHNC.

*Indirect Impacts to Aquatic Resources and Fisheries*

The proposed action would cause both temporary and long-term (permanent) indirect impacts to aquatic resources and fisheries in the study area. These impacts would be expected to occur during construction activities (approximately 36 months) because of substantial changes in turbidity, salinity, DO levels, and velocities, specifically for approximately 6 months to 12 months while the cofferdam is blocking flow in the IHNC. After construction is complete, changes in velocities and salinity would be expected to be minor the majority of the time during times when the gates are open. The following paragraphs discuss indirect impacts related to turbidity, DO, salinity, velocity, and transport and migration.

<u>Turbidity</u>

Siltation from filling the scour hole, constructing the cofferdam, and other construction activities could choke benthic organisms and siltation plumes of long duration could stress and kill benthic fauna. Diminished sunlight penetration may affect phytoplankton populations in the project area. Both these disturbances would impact species in the project area by decreasing the abundance of prey available, as well as their ability to catch prey. These impacts would be expected to be considerable while the scour hole is being filled and during construction of the cofferdam even though BMPs would be used to the maximum extent possible. Indirect impacts would only occur for approximately 36 months. Although some increased turbidity levels would be expected for the duration of construction, these increases would be less than the turbidity levels expected during filling of the scour hole and constructing the cofferdam.

Dissolved Oxygen

DO modeling for the construction scenario and operation scenario were conducted to predict changes in DO from the implementation of various projects in the project vicinity. Modeling conditions, limitations, and results are discussed in detail in section 3.2.2 (Water Quality).

Indirect impacts to aquatic resources and fisheries may occur during construction due to changes in water characteristics. Impacts would most likely be temporary and caused by the displacement of organisms from localized areas due to elevated turbidity levels, decreased DO, and increased biological oxygen demand (BOD) associated with construction and filling activities. Sessile organisms would be expected to be negatively influenced during construction. Organisms that are not buried during construction and filling activities could be suffocated or would have to overcome 6 months to 12 months of low DO conditions. It is possible that the portion of the IHNC in the project area could become a "dead zone" for sessile organisms until the proposed action is complete. Calibration verification of the DO model and additional monitoring is being investigated to demonstrate whether the low DO observed in the past would reoccur annually.

The temporary blockage of the IHNC has the potential to cause fish kills north and south of the cofferdam. Although fish kills have been previously documented along the south shore of Lake Pontchartrain during August and September, the impacts from the cofferdam would be expected to be greater than impacts that have been documented in the past. Similar occurrences have been documented at the closure of the MRGO at Bayou La Loutre. If kills do occur they would be caused by persistent low DO levels, from the blocked flow. These would only occur while the cofferdam is in place and would not be expected to occur after the sector gate and two vertical lift gates are in place. If fish kills occur, they would cause similar results to aquatic/fisheries species such as *Rangia* clams, shrimps, and crabs. It is not likely that the number of individuals killed would have a long-term impact on the basin-wide populations of aquatic/fisheries species. Temporary, localized impacts on populations may occur. If large numbers of individuals are killed, populations would rebound; however, this may take several years as the system comes to a new equilibrium from all the other ongoing projects in the area.

Filling the scour hole south of the Seabrook Bridge may cause permanent beneficial changes to DO levels in the INHC after construction is complete and while it has the potential to ultimately improve water quality conditions in the project area and the study area, DO levels are still predicted to be less than the standard of 4.0 mg/L (Dortch and Martin 2008). Research on the Patuxent River, Chesapeake Bay, found that hypoxia may affect fish larvae through decreased growth and survival, limitation of habitat availability, and by altering predator-prey interactions (Keister et al. 2000). The effect of any disturbance in the physical habitat is likely to differ among species, leading to altered growth or predation mortality through changes in predator and prey distributions. The beneficial impact of improving DO conditions in the IHNC may result in organisms using less energy for respiration, which would allow them to allocate more energy to find food, hiding from predators and traveling to nursery areas or spawning grounds. This anticipated improvement in DO conditions would be anticipated to especially benefit *Rangia* clams and other benthic organisms.

Salinity

TABS-Multi- Dimensional Sediment (MDS) hydrodynamic numerical model (Tate et al. 2002) used for salinity modeling was conducted by ERDC to predict changes in salinity in the project vicinity (Martin et al. 2009b). Modeling conditions, limitations and results are discussed in detail in section 3.2.2 (Water Quality).

Blocked flow between the IHNC and Lake Pontchartrain while the cofferdam is in place would cause salinities to be slightly lower than the current levels to the north of the project area, and therefore, alter water quality parameters and benthic habitat. Alterations would include potential benefits to benthic communities (benthic habitat and water quality) in the southeastern portion of the lake.

Partially filling the scour hole in the IHNC may result in positive changes to salinity in this area of the IHNC by removing a sink for heavier saline water that gets trapped in the deeper portion of the hole. However, due to the origin of the scour hole (most likely the result of extreme storm event tidal flow into and out of the lake), mixing in the scour hole during these storm events may eliminate salinity stratification and this habitat may provide a refuge for fish populations.

Organisms that utilize tidal flow and salinity gradients for passage may follow the altered gradients to the Rigolets and Chef Menteur Pass instead to access nursery and breeding grounds closer to the Gulf of Mexico. Accessibility of the marsh areas such as those near Bayou Bienvenue, which may already contain altered salinity due to the MRGO closures at Bayou La Loutre and Bayou Bienvenue, may be less accessible for organisms due to changes in tidal velocity and passage constraints. Alternatively, changes to tidal flow within the GIWW due to the MRGO closures at Bayou La Loutre and Bayou Bienvenue may make traversing this reach of the waterway more direct because of the sloshing effect from several waterways. If carrying capacity has been reached in the foraging and nursery areas of northeastern portions of Lake Pontchartrain, then additional population loads may be disadvantageous. Additional organisms or entire populations could increase resource pressure during the construction period and cause temporary effects to population numbers. Density and distribution of SAV beds along the eastern shore of Lake Pontchartrain may increase as a result of lower salinity levels.

Velocity

ADH modeling was conducted by the ERDC to predict velocities in the proposed action area and is discussed in detail in section 3.2.1 (hydrology). Once the proposed action is in place, velocities would exceed 2.6 fps in several locations throughout the project vicinity. High velocities are predicted to occur in the GIWW periodically and in the channel that runs north-south between Bayou Bienvenue and Bayou La Loutre and connects the MRGO to Lake Borgne. In the IHNC, velocities greater than 2.6 fps would be expected to occur 40 percent of the time under September conditions and 55 percent of the time under March conditions (see arrows on figures 29 and 30).

According to the modeling results, velocities greater than 2.6 fps would be expected to occur both during construction and after the proposed action is in place (see dashed lines and arrows on figures 29 and 30). These conditions would inhibit fish passage and would cause greater adverse impacts to those aquatic organisms unable to swim as proficiently as most fish. Given these results, the proposed action would make it difficult for aquatic resources and fisheries such as shrimp smaller than 100 mm, blue crabs, and fish smaller than 40 mm to traverse the project area in the IHNC (Smith 2008). However, since aquatic resources and fisheries most likely already experience unfavorable conditions for passage given historic average velocities, this increase in velocity is not expected to cause significant adverse impacts to these aquatic organisms.

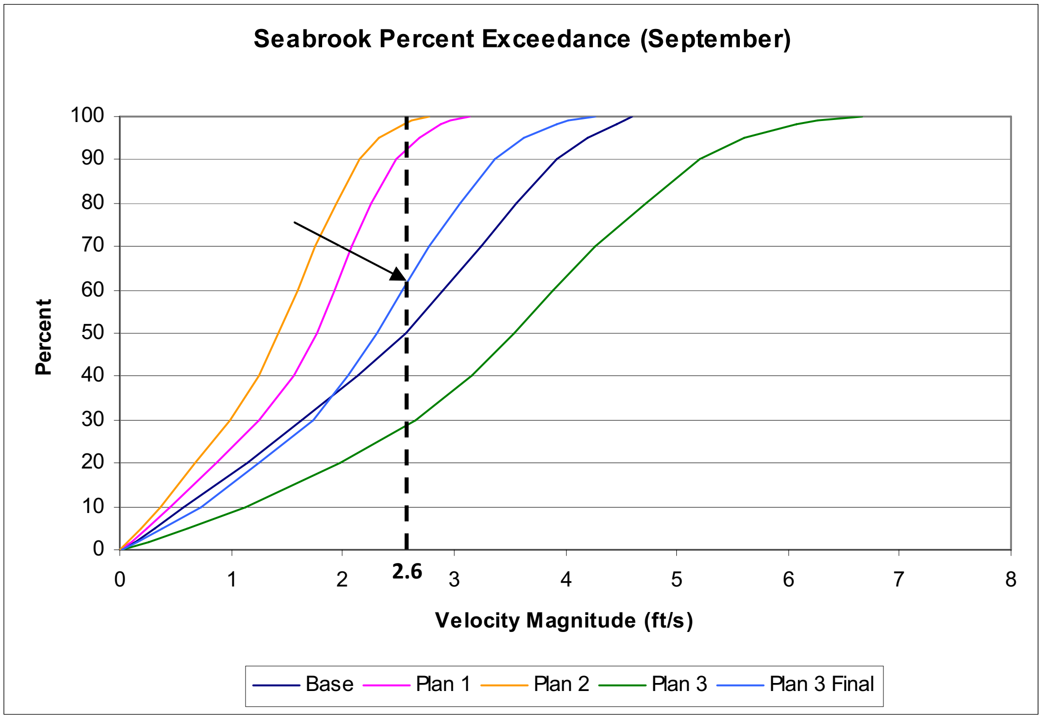



**Figure 29. Seabrook Percent Exceedance Plot for September**

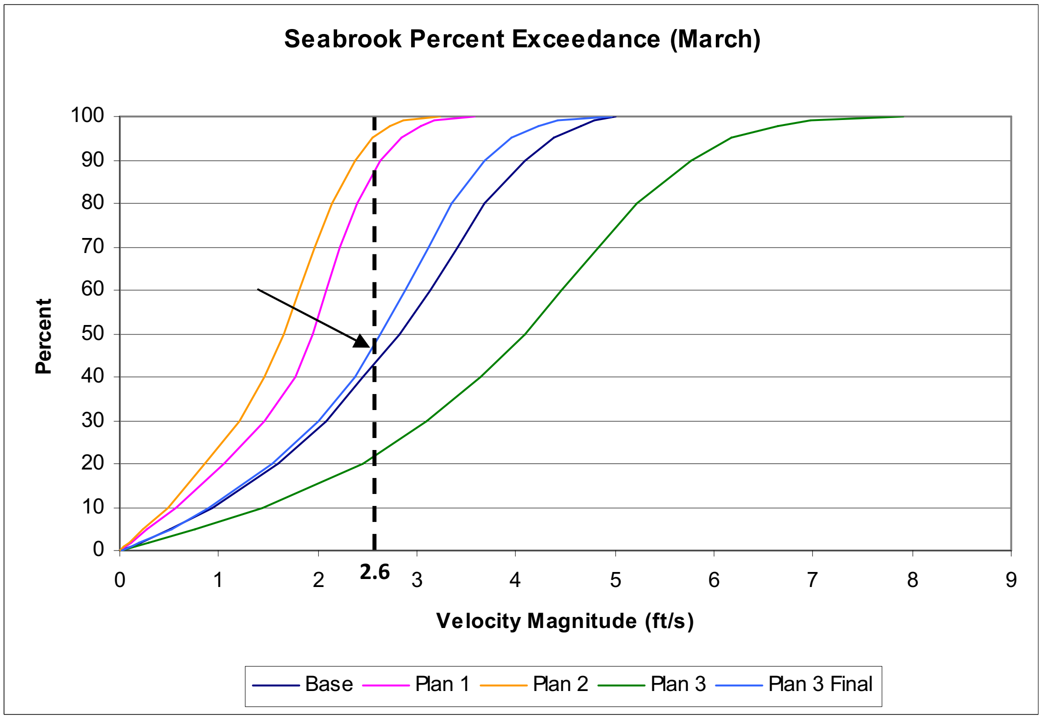



**Figure 30. Seabrook Percent Exceedance Plot for March**

After project completion, aquatic resources and fisheries such as blue crabs and shrimp would be expected to emerge into Lake Pontchartrain predominantly through the northeastern passes as the result of tidal flow. Swimming aquatic organisms and those organisms that use passive transport or rely on cues to migrate in flood tide that moved to the west in the GIWW would have a longer travel time through the IHNC to reach areas of suitable habitat. This could be especially important for tidal lateral moving larvae such as shrimp and blue crab.

The proposed action could also have an impact on the productivity of some aquatic species and fisheries that utilize Lake Pontchartrain as a nursery area since plankton, macroinvertebrates, and fishes use three passes (the Rigolets, Chef Menteur Pass, and the IHNC) to migrate into and out of Lake Pontchartrain (see Existing Conditions for Aquatic Resources for more detail). Larval and post larval life stages of some species (such as blue crab, several drum species, and shrimp) use flood tides to migrate into Lake Pontchartrain through the three passes and any reduction in tidal flows would lower migration opportunities. Swenson and Chaung (1983) conducted studies on water volume exchange in estuarine systems and found that the Rigolets is primarily flood-dominated whereas Chef Menteur Pass and the IHNC are primarily ebb-dominated. These findings are supported by the Hydrodynamic Validation modeling which found that under existing conditions velocities of ebb tides in the IHNC ranged from about 3 fps to 6 fps versus flood tides which ranged from about 0 fps to 1 fps (validation modeling data was only looked at for one 24-hour period in October 2008 and no data was collected during peak flow conditions; USACE 2009c). As a result of this information, it is reasonable to assume that larval transport into Lake Pontchartrain occurs mainly through the Rigolets and transport out of the lake through Chef Menteur Pass and the IHNC. If tidal flow is reduced through the IHNC, greater impacts may occur to species such as blue crab, white shrimp, and brown shrimp which utilize the estuarine and marine ecosystem to complete their life cycles compared to *Rangia* clams.

Transport and Migration

PTM was used to simulate larval transport for eight dominant fish/macroinvertebrate species using four larval behavior types (lateral, vertical, bottom, and passive) assigned to particles. Limitations to PTM applied to larval fish behaviors are that these particles do not have the many types of realistic life traits which may or may not affect the transport of living organisms and that the minimum velocity used in PTM is a best estimate due to knowledge of certain larval species (USACE 2009c). The species selected all play key roles in the trophic system of Lake Pontchartrain. These species include bay anchovy, Gulf menhaden, red drum, brown shrimp, white shrimp, spotted seatrout, blue crab, and Atlantic croaker. Model scenarios were coordinated with the interagency team made up of representatives from NMFS, USEPA, Louisiana Department of Natural Resources (LaDNR), LaDWF, U.S. Fish and Wildlife Service (USFWS), and USACE. In addition, work is being reviewed by experts from the Netherlands, ERDC, and University of New Orleans (UNO).

The movement or transport of larvae between the coastal estuaries and Lake Pontchartrain was simulated by the PTM at several locations with the aquatic ecosystem (MRGO, the GIWW, and Lake Borgne; figure 31). Two analysis periods, September 2007 and March 2008, were chosen by the interagency team; March is indicative of more erratic conditions due to rain events and frontal passages, and September represents lower wind speeds and more typical diurnal tides expected in the Gulf of Mexico (USACE 2009c).

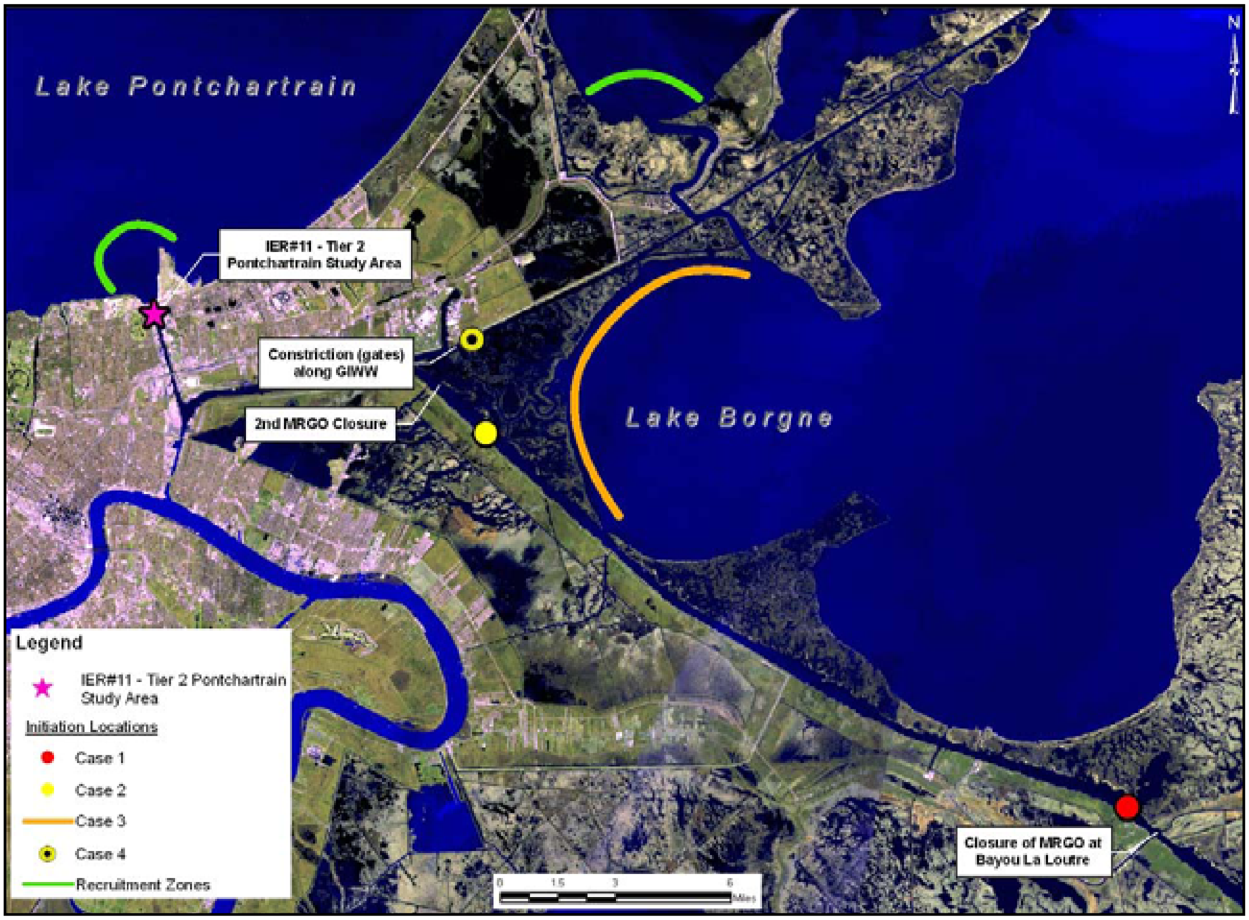



**Figure 31. Larval Modeling Initiation Locations (Case 1-4) and Recruitment Zones**

Due to the complex nature of tidal flow through the study area the model required designated consistent directions for incoming (flood) and outgoing (ebb) tides for a given scenario. To evaluate all the possible changes to larval migration, flood tide was set as east or west and each scenario was run with flood tide going east and flood tide going west. The initiation point of the larval organism-like particles (GIWW or Lake Borgne) and the direction of the incoming tide both have an impact on the predicted percentage of recruitment into Lake Pontchartrain with the five scenarios run. The modeled scenarios discussed in this section include:

- Base – All open (similar to historical conditions for the area);
- plan 1 – Closure of the MRGO at Bayou La Loutre;
- plan 2 – Closure of the MRGO at Bayou La Loutre plus the Borgne Barrier;
- plan 3 – plan 2 plus a Seabrook gate with a single 95 ft by 16 ft opening; and
- plan 3 final - plan 2 plus the proposed action.

PTM results indicate that the proposed action, in conjunction with the Borgne Barrier and the MRGO closure at Bayou La Loutre, may cause a 6 percent to 10 percent decrease in the dispersion of larval organisms into Lake Pontchartrain. However, there is no predicted impact on the recruitment of larval organisms when particles are initiated in Lake Borgne (change of < 1 percent). When particles are initiated in the GIWW and incoming tide in the GIWW is west, recruitment declines 7.81 percent in September (from 49.86 percent to 42.05 percent) and 6 percent in March (from 57.58 percent to 51.58 percent; USACE 2009c). The majority of the particles recruit into Lake Pontchartrain via the IHNC with most of the impact occurring to tidal lateral behavior types (e.g. brown shrimp, white shrimp, Gulf menhaden, Bay anchovy, and red drum). When particles are initiated in the GIWW and incoming tide in the GIWW is east, recruitment declines 9.77 percent in September (from 33.72 percent to 23.95 percent) and 7.56 percent in March (from 32.79 percent to 25.23 percent) (USACE 2009c; figures 32 and 33). The majority of the particles recruit into Lake Pontchartrain via Chef Menteur Pass with most of the impact occurring to bottom movers (e.g. Atlantic croaker) and tidal lateral behavior types (e.g. brown shrimp, white shrimp, Gulf menhaden, bay anchovy and red drum). The somewhat larger decline in recruitment with the east incoming tide could be due to the time and distance associated with navigating through Chef Menteur Pass. This predicted 6 percent to 10 percent decline in recruitment could have some direct impacts to the overall population of these organisms because fewer organisms would occur in the system. Indirect impacts could be less prey available for seatrout and other predator fish if recruitment of shrimp and Atlantic croaker decline.

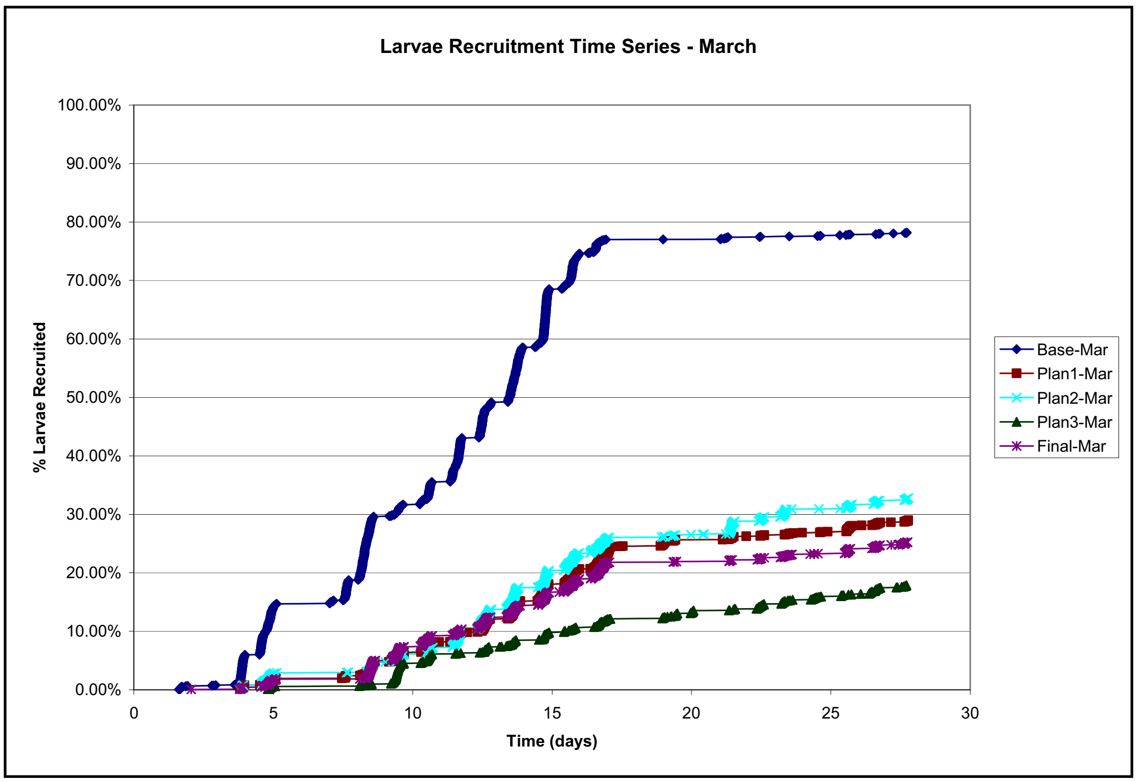



**Figure 32. Comparison of Larvae Recruitment Time Series for Case 4 during March 2008**

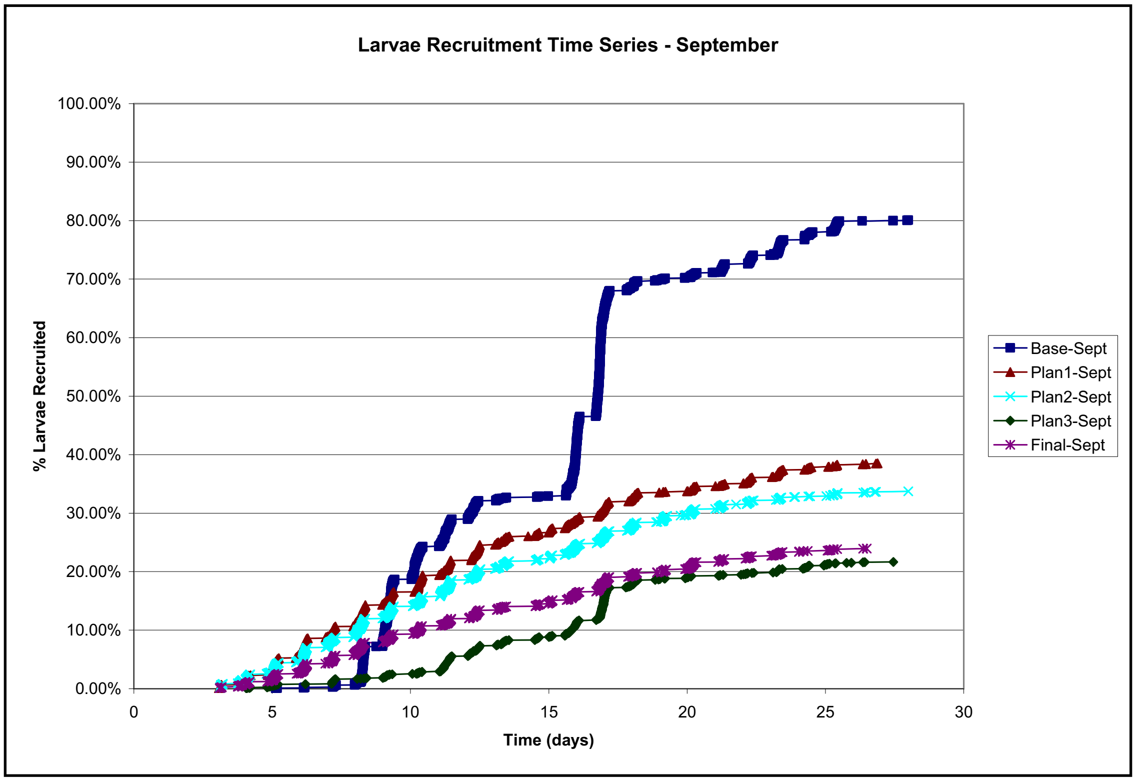



**Figure 33. Comparison of Larvae Recruitment Time Series for Case 4 during September 2007**

When model organisms were initiated in the GIWW east of the proposed GIWW gates, and in the MRGO south of the Bayou Bienvenue closure, there was an overall decrease in the percentage of larvae that arrived at the recruitment areas during a 4-week period. The majority of this decrease occurred due to the closure of the MRGO at Bayou La Loutre but an additional decrease in recruitment occurred in both September and March (times of fall and spring high tides) due to the proposed action. Of the behaviors implemented in the model, the tidal vertical and tidal lateral behaviors were more greatly impacted than the bottom and passive movers. One reason for this is that initially, more tidal vertical and lateral organisms successfully recruited within the base scenario. When model organisms were initiated in Lake Borgne (case 3, figure 31), the proposed action did not have any additive impacts to recruitment compared to existing conditions (comparison of plan 2 and plan 3 final). It is important to note that even though particles are unable to the recruit to the "recruitment zones" designated in the model, they are still in the system and could reach the recruitment zones at a time later than the four week analysis; they have not died. Therefore, recruitment declines in Lake Pontchartrain through the three passes may indicate that organisms are recruiting to other areas in the project vicinity such as Lake Borgne. If this is true the decline in recruitment into the lake would be partially offset by an equal sized increase in Lake Borgne. Conversely, bottle necks that occur in the GIWW between the junction of the GIWW with the IHNC and the GIWW sector gate in the plan 3 final (Case 4) scenario may be one indication that organisms trying to recruit to nursery areas may not be able to make it due to "clogging" at the various constrictions in the project vicinity.

Currently there are several limitations to these applied behaviors. Even though the ultimate goal is to model the behavior of the larvae, larval behavior is not completely understood. PTM is applied with the understanding that the program is modeling particles that have the aforementioned characteristics and not actual larvae which can die, consume, and have other life traits which may or may not affect their transport. Modeled particles have simplistic character traits which are suspected to affect transport and recruitment time. Additionally, model prediction values are variable depending on where the particles are initiated, and the overall percent of recruitment (even under the base scenario) is most likely underestimated.

Based on the results of PTM discussed previously, slowed velocities along the GIWW into the IHNC and changes in directional flow would increase migratory time to enter the lake through the IHNC and reduce recruitment of larval life stages of fisheries species. Blockage of access during the construction phase of the project would potentially trap and separate all life stages of prey (bay anchovy, Gulf menhaden, and *Rangia* clams) and predatory species (spotted seatrout, and red drum) from the less saline waters necessary for life cycle requirements and from adequate habitat for protection and foraging, thus resulting in possible starvation or increased predation pressure. Flow in the waterways due to the temporary blind end of the IHNC would still be affected by tide reversal which would generally influence bottom waters to move into and surface waters to move out of the INHC through the GIWW (Dortch and Martin 2008). This is expected to disrupt larval migration and any advantage that many of these organisms may have had in exiting the IHNC after arrival, depending on their migratory behavior in utilizing tidal flow. This could have localized effects on population year class strength.

Once the cofferdam is removed, obstruction created by the gate placement near the Seabrook Bridge could provide “protected” areas in the vicinity of the structure for some organisms, but could also create a trap or gyre for many organisms which do not have sufficient control to manage any resulting eddies. Food depletion and increased predation stress could result. Resulting impacts could range from changes in behavior to slower growth rates to starvation and death and increased predation mortality. Sloping the sill and directing the flow to the center of the channel combined with construction of a training wall is intended to decrease this impact as well as reduce bank erosion. These impacts would be minimized and possibly negated if a training wall was designed and installed to prevent eddies and gyres. This design feature will be utilized to the maximum extent possible.

During construction, fisheries in Lake Pontchartrain would experience significant, adverse effects, at least in the immediate project area and migratory patterns would be significantly altered for the rest of the Lake Pontchartrain Basin due to a lack of passage into and out of the lake at this location. This would affect populations of bait fish (bay anchovy, Gulf menhaden and Atlantic croaker) and other commercially important species, such as blue crabs, which migrate inshore at this location in May to June (Lyncker 2008) and shrimp species which historically utilize this passage. Therefore, commercial and recreational fishing activities would be significantly altered and possibly economically affected as well during the 6 months to 12 months that the cofferdam is in place.

Blue crab migration into Lake Pontchartrain specifically occurs from May to June through the IHNC. This influx of larvae would be disrupted by the construction phase of the project (approximately 36 months) and could adversely overlap more than one breeding cycle of this species, as well as the breeding cycles of other migratory species which may depend on this man-made conduit into Lake Pontchartrain. This would affect juvenile and adult fisheries populations, specifically those such as the red drum and black drum which favor blue crab stocks for prey.

Once the proposed action is complete, access to Lake Pontchartrain would be restored and effects from construction should be alleviated. Population-level impacts may be experienced if closure of the channel exceeds the anticipated duration of approximately 6 months to 12 months. Fisheries species would be able to pass into and out of Lake Pontchartrain through the floodgates. When the gates are in the closed position during a storm event, high flow event, or monthly OMRR&R, organisms would be cut off from passage to and from Lake Pontchartrain through the IHNC; however, this would be temporary (described further in section 1.6) and should have a minimal effect.

*Cumulative Impacts to Aquatic Resources and Fisheries*

Cumulative impacts from the proposed action would involve the combined effects from multiple IERs, Louisiana Coastal Area Study projects (e.g., Maurepas Diversions), and CWPPRA projects throughout the project vicinity, including the Violet Freshwater Diversion project; the MRGO closure at La Loutre, and several other wetland restoration projects which would reduce potential adverse cumulative impacts by positively affecting aquatic resources and fisheries within the project area. While these restoration projects would help to offset habitat loss from the proposed action, restoration projects are largely aimed at creating wetlands and not deep water habitat that would be lost with the proposed action. The combined restoration projects, if funded and constructed, would enhance marsh edge and shallow water habitat, which have been shown to be more productive than habitats currently found in the project area; therefore, the overall net effect would be positive. The combined effects of other projects including the Borgne Barrier, the closure of the MRGO at Bayou La Loutre, and the Violet Diversion would result in varying degrees of altered hydrology, salinity, DO, and velocities throughout the project area. The net cumulative effects of the IER and CWPPRA projects will be complex and difficult to quantify. There would be both positive and negative effects to aquatic resources and fisheries throughout the project area and vicinity.

Potential cumulative impacts to aquatic resources and fisheries in the project vicinity could occur from construction-related activities (e.g., turbidity from dredging, noise) and from the various on-going, completed, and authorized projects (e.g., changes in salinity, velocity, and circulation/flow). Although the project area has already been altered by construction and maintenance of navigable waterways and the existing HSDRRS, the proposed action would contribute to changes both beneficial (improving salinity and DO concentrations in some areas) and negative (temporary and permanent decrease in dispersion of organisms related to adverse DO and tidal passage) to aquatic resources and fisheries including prey species, phytoplankton, zooplankton, adult bivalves, and crustaceans.

Improving water conditions would help organismal respiration allowing them to use more energy for finding prey, hiding from predators and finding suitable habitat. Improving water conditions may also provide more productive habitats for oysters, *Rangia* clams and SAV to increase their distribution in Lake Pontchartrain. Hydrology changes may negatively affect fisheries resources by decreasing recruitment of larvae (especially tidal lateral movers such as shrimp, bay anchovy, Gulf menhaden, and red drum).

The proposed action, in combination with other projects occurring in the New Orleans area, would have both positive and negative cumulative impacts to aquatic resources and fisheries. Changes in salinity are occurring from closure of the MRGO at Bayou La Loutre, the Borgne Barrier, and minor contributions in salinity change are expected from the proposed action. Modeling conducted by ERDC illustrated that the closure of the MRGO at Bayou La Loutre would have a significant effect on monthly average bottom salinity values not only in MRGO/GIWW/IHNC, but also in the Lake Borgne area and in some areas of Lake Pontchartrain. Most areas showed decreases of 3 ppt to 4 ppt, with the highest decrease (approximately 10 ppt) occurring in the MRGO region just north of the La Loutre closure, and minimal changes occurring at Seabrook (< 1 ppt change) (Martin et al. 2009b). The overall change to salinity could be both positive and negative to aquatic resources and fisheries.

It is expected that due to the MRGO closure at Bayou La Loutre, environmental conditions would be freshened. Although salinity would be freshened closer to historic conditions, species inhabiting the project vicinity are accustomed to salinity conditions prior to the implementation of these projects and these conditions would impact the existing habitats and resources as organisms adapt to the new environmental conditions. Reductions in salinity would impact the existing system in the short-term by creating localized community and habitat shifts, a disconnection between predators and prey species, changes in behavior, decreases in growth rates, and shifts in populations of some species. The direct impacts from closure (construction, velocity, and OMRR&R closures) may substantially affect the distribution and relative abundance of fisheries species. However, the project would be potentially beneficial in the long-term because valuable habitats for aquatic resources and fisheries would be more productive after the ecosystem is restored to near-historical conditions. This would be especially beneficial for benthic organisms because poor DO and salinity conditions would show the most improvement at the bottom of the water column. Benefits may include increases in the populations of oysters and *Rangia* clams. Shrimp and crabs able to make it into Lake Pontchartrain (by overcoming changes to tidal direction and tidal pulse) may also benefit from improved water quality conditions. Although, the proposed action alone would not affect the distribution, abundance or health of SAV in Lake Pontchartrain the additive impact of the projects discussed previously and the proposed action may have a positive impact on SAV by allowing it to restore closer to historic abundances.

Dispersion of all life stages of aquatic resources and fisheries would experience an additive effect from the MRGO closure at La Loutre, the Borgne Barrier, and the proposed action (figures 32 and 33). Organisms would be unable to use the MGRO and access through the Golden Triangle marsh would be restricted to a small opening at Bayou Bienvenue for transport or migration to Lake Pontchartrain; however, the IHNC via the GIWW (except for 6 months to 12 months during construction of the proposed action) and two passes in the eastern portion of the lake would be available. Even though larval transport and migration of other life stages may be reduced into Lake Pontchartrain through the IHNC, organisms could see a benefit from the overall change in flow direction from the implementation of the MRGO closure at La Loutre, the Borgne Barrier, and the proposed action. If organisms used alternate routes such as the Rigolets and Chef Menteur Pass they could enter and settle out in the east portion of Lake Pontchartrain, which contains more abundant high quality habitat, including natural shorelines bordered with complex habitat mosaics (SAV, *Rangia* clams, and oyster shells). Recruiting into a higher quality habitat could result in higher growth rates, less predation, and a greater chance of individuals successfully growing to maturity and spawning. However, if habitats have already met carrying capacity, then the required transitory migration of additional organisms into this area could create pressure on resources due to competition and overuse. This could be disadvantageous to all species that utilize this ecosystem.

For 6 months to 12 months during construction of the proposed action a cofferdam would block flow between the IHNC and Lake Pontchartrain. Additionally, the timing of the construction sequence of Seabrook and various features of the Borgne Barrier including the GIWW sector gate and Bayou Bienvenue gate may overlap for up to 11 months. The GIWW would still allow flow and navigation through the gate during this phase of construction, but the channel opening would be reduced from 300 ft to 150 ft. A cofferdam would be placed at Bayou Bienvenue constricting the flow to four 48-inch culverts. The cofferdam at Seabrook, along with the constriction on the GIWW and cofferdam at Bayou Bienvenue (closed except culverts to allow some flow) would severely restrict access of aquatic resources and fisheries species to quality habitat. This restriction could cause an increase in predation of some lower trophic level species, change the prey items that are available to predators, and cause predators to travel longer distances during construction and would extend an already lengthy trip, thereby decreasing growth rates, overall health, and possibly the ability of some individual aquatic resources and fisheries to reproduce.

These temporary constrictions could cause fish kills due to low DO, decreased flow, and increased temperatures and turbidity. Fish kills in multiple areas within the project vicinity would impact a larger number of individuals and could cause slower growth rates in individuals subjected to this environment, and would decrease survival of some species causing changes in overall community structure near the closures.  Greater impacts are expected from the MRGO closure due to the higher salinities and deeper water depth in the area as compared to the proposed action.

One possible positive benefit of the closures along the MRGO, the Borgne Barrier, and the proposed action would be that the Golden Triangle marsh and associated canals would become less saline.  This overall freshening of water conditions is predicted to increase habitat value in the project vicinity which could assist in increasing the productivity of some aquatic and fisheries resources.  However, this potential increase in productivity could be minimized or changed due to interactions between the freshening, the subsidence of wetlands, and relative sea level rise that is expected to occur.  The impact to aquatic resources and fisheries resource due to interactions between subsidence, sea level rise, and the current and future projects proposed in the foreseeable future is currently a data gap and is discussed in the section 1.6 (Data gaps and Uncertainty).

Additionally, multiple gate structures and barriers across the marsh will alter tidal flow in the system thus increasing travel times for tidally dependent organisms. This would have significant negative impacts to recruitment of some aquatic resources and fisheries into Lake Pontchartrain. USACE (2009c) predicted that the cumulative impact would be a 6 percent to 10 percent decline in recruitment of larvae during March and a 3 percent to 7 percent decline during September for all behavior types when particles are released in Lake Borgne.  Tidal lateral movers (white shrimp and brown shrimp) experienced the largest decline in recruitment as compared to tidal vertical (blue crabs), and passive movers.  This decline was experienced equally through both Chef Menteur Pass and the IHNC.  If this reduction in recruitment occurs, Lake Pontchartrain could experience an overall decrease in populations of several species that play key roles in its community structure.  It is expected that not only larval organisms, but all life stages of species that rely on the various migration/transportation routes (the MRGO, GIWW, and interdispersed wetlands in the Golden Triangle) would be impacted by the collective implementation and operation of the Borgne barrier, the MRGO closure at Bayou La Loutre, and the Seabrook gate. The Seabrook gate alone has the least amount of anticipated impacts among these projects.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to Aquatic Resources and Fisheries*

Overall, direct impacts to aquatic resources and fisheries would be similar to those discussed under the proposed action; alternative #2 would impact the same total area of open water as the proposed action, approximately 9 acres.  The scour hole would also require partial filling under this alternative which would result in similar but slightly fewer impacts than the proposed action since the alignment for alternative #2 would not directly cross the hole.  The filling of the scour hole for alternative #2 would not have the same level of beneficial impacts of improved DO and salinity conditions as was described under the proposed action.

The alternative #2 alignment may trap water between its structures and the railroad bridge.  The obstruction created by the gate placement near the Seabrook Bridge could provide "protected" areas in the vicinity of  the structure for some organisms, but could also create a trap or gyre for many organisms which do not have sufficient control to manage any resulting eddies.  Sloping the sill and directing the flow to the center of the channel is intended to decrease this impact as well as reduce bank erosion.  Depletion of food sources and increased predation stress could result.  Resulting impacts could range from changes in behavior to slower growth rates to starvation and death and increased predation mortality.  These impacts would be minimized and possibly negated if a training wall was designed and installed to prevent eddies and gyres. This design feature would be utilized to the maximum extent possible.

Temporary impacts to aquatic resources and fisheries due to construction activities and from placement of the cofferdam across the channel would be similar to the proposed action. Noise occurring from construction activities would occur for a similar period of time, therefore similar impacts from noise would occur from alternative #2.

*Indirect Impacts to Aquatic Resources and Fisheries*

Indirect impacts to aquatic resources and fisheries in the study area would be similar to those experienced with implementation of the proposed action. Partial filling of the scour hole would result in fewer construction impacts, would still leave some deep water habitat in the IHNC, but would not have the same positive impacts of improved DO and salinity conditions.

*Cumulative Impacts to Aquatic Resources and Fisheries*

Cumulative impacts to aquatic resources and fisheries under alternative #2 would be similar to those described under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Aquatic Resources and Fisheries*

Some direct impacts to aquatic resources and fisheries would be similar to those discussed under the proposed action; however, alternative #3 would impact approximately 12 acres of open water (10 acres of permanent easements and 2 acres of temporary easement) as compared with approximately 9 acres for the proposed action. Unlike the proposed action, no scour holes are present near the alternative #3; therefore filling a scour hole would not be included in the construction.

During construction a temporary, braced cofferdam would be installed in the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. Due to the location of alternative #3, this cofferdam would not block all flow between Lake Pontchartrain and the IHNC because water would still be able to flow around the cofferdam through the Turning Basin (figure 12). Temporary impacts to aquatic resources and fisheries (benthic invertebrates, zooplankton, phytoplankton, and larvae) from construction of the cofferdam in a wider section of the channel (as compared to the proposed action) may result in fewer temporary impacts because some volume of water would be allowed to flow into Lake Pontchartrain between the shoreline and the cofferdam.

The location of alternative #3 would not trap water between the alignment and the railroad bridge because alternative #3 is 1,500 ft south of the Seabrook Bridge, but gyres and eddies may be possible in the Turning Basin north and south of the floodwall and within the Barge Slip. Noise occurring from construction activities would occur for a period of time similar to that of the proposed action.

Although alternative #3 spans twice the amount of water as the proposed action, the expanded footprint would not result in a larger area of open water and bottom habitat disturbance than the proposed action since the proposed action would require a large amount of ROW to be required to fill in the existing south scour hole.

*Indirect Impacts to Aquatic Resources and Fisheries*

Indirect impacts to aquatic resources and fisheries would be similar to those described under the proposed action. However, increases in disturbance would result from the longer construction time to build the gate structure and would result in longer disturbance to the water clarity, salinity, and DO. Additionally, under alternative #3, the scour hole would not require filling, thereby preserving this deep water habitat for some species and decreasing mortality to species that use this area as a refuge. However, according to model results, DO conditions in the IHNC may remain low if this highly stratified deep habitat is not filled, possibly causing more stress of some species traversing the IHNC.

*Cumulative Impacts to Aquatic Resources and Fisheries*

Cumulative impacts to aquatic resources and fisheries under alternative #3 would be similar to those described under the proposed action with the exception of impacts associated with filling the scour hole and the cofferdam blocking flow.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Aquatic Resources and Fisheries*

Overall, direct impacts to aquatic resources and fisheries would be similar to those discussed under the proposed action; however, alternative #4 would permanently impact approximately 10 total acres of open water (approximately 7 acres for permanent ROW and 3 acres for temporary easements) as compared with approximately 9 acres for the proposed action. Unlike the proposed action and alternative #2, no scour holes are present near the alternative #4 alignment; therefore filling a scour hole and associated positive and negative impacts would not occur.

*Indirect Impacts to Aquatic Resources and Fisheries*

Indirect impacts to aquatic resources and fisheries would be similar to those described under the proposed action. However, under alternative #4, the scour hole would not require filling, thereby preserving this deep water habitat for some species and decreasing mortality to species that use this area as a refuge. According to model results, DO conditions in the IHNC may remain low if this highly stratified deep habitat is not filled, possibly causing more stress to some species traversing the IHNC.

*Cumulative Impacts to Aquatic Resources and Fisheries*

Cumulative impacts to aquatic resources and fisheries under alternative #4 would be similar to those described under the proposed action with the exception of impacts associated with filling the scour hole.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Aquatic Resources and Fisheries*

Overall, direct impacts to aquatic resources and fisheries would be similar to those discussed under the other alternatives; however, alternative #5 would impact approximately 18 total acres of open water (approximately 10 acres of permanent easements and 8 acres of temporary easements) as compared with approximately 9 acres for the proposed action. Instead of filling the southern scour hole, the northern scour hole would be partially filled in Lake Pontchartrain.

Temporary impacts to aquatic resources and fisheries due to construction activities and from placement of the cofferdam would be less as compared to alternatives #1 through #4 except for noise impacts and scour hole impacts. Noise occurring from construction activities would be less contained because construction would occur in the lake. Additionally, construction in the lake would most likely impact a larger number of *Rangia* clams (because they are more abundant in the lake), and large fishes (because the scour hole is deeper, larger, and more accessible from other habitats).

*Indirect Impacts to Aquatic Resources and Fisheries*

Under alternative #5, indirect impacts to aquatic resources and fisheries would be greater with regard to siltation, but less with regard to velocity, DO, and salinity than the proposed action. During construction, partial filling of the northern scour hole would result in fewer construction impacts from burial and/or suffocation of organisms and would still provide some deep water habitat in the IHNC because the southern scour hole would not be filled. Construction in the lake would occur in phases that would allow flow between the IHNC and Lake Pontchartrain to be maintained throughout construction. However, phased construction would also extend the construction duration. Maintaining flow through the IHNC would lessen the possibility of persistent anoxic conditions leading to fish kills, and would allow organisms to continue to be transported or migrate through the IHNC. Alleviating these impacts would have less negative effect on the behavior, growth rate, feeding, recruitment, and growth to maturity compared to the other alternatives. The increase in overall construction duration could impact aquatic resources and fisheries such as *Rangia* clams located near the project area, but once construction was complete populations would be able to recover. SAV would not be expected to be negatively impacted by the location of this project during construction. Turbidity would be controlled to the maximum extent possible and the nearest SAV bed is 4 miles northeast of the project. The duration of construction and associated noise may cause some behavioral changes to aquatic resources and fisheries and their prey occupying the project area for longer durations as compared to the other alternatives, but the types of impacts would be similar to the proposed action.

After alternative #5 is complete, DO, and salinity conditions would not improve as much with the proposed action because only partial filling of the northern scour hole would occur.

*Cumulative Impacts to Aquatic Resources and Fisheries*

Cumulative impacts to aquatic resources and fisheries under alternative #5 would be similar to those described under the proposed action with some slight differences due to placement of the alignment in the lake, partial filling of the northern scour hole, and phased construction that would not require blocking flow between the lake and the IHNC for approximately 6 months to 12 months. Overall, similar impacts would occur because the majority of changes such as salinity reductions, reduced tidal pulse, and increases in DO are due to the implementation of the Borgne Barrier, the Violet Diversion, and the closure of MRGO at Bayou La Loutre.

Slight differences to cumulative impacts would include an increase in direct impacts to habitat (open water and substrate) from the physical placement of alternative #5 in the lake, which would result in a larger footprint as compared to the proposed action. This slight increase in the footprint would partially deplete the deep water habitat where large red drum and spotted seatrout are known to occur. Partially depleting this habitat could create increased competition for space, small decreases in growth rates, and increased predation by fishing of mature fish capable of spawning. The number of fish impacted by the partial filling of the scour hole would not be expected to cause changes in population for these species in Lake Pontchartrain.

Phased construction would reduce the cumulative impacts to aquatic resources and fisheries species by reducing the possibility of fish kills that would occur with the proposed action (from the IHNC cofferdam). Fish kills would not be expected with alternative #5 because flow between the lake and the IHNC would remain open during construction. This would reduce the additive impact on the overall number of organisms killed by anoxic conditions even though construction would occur for a longer period of time. A reduction in the number of fish kills in the project vicinity would result in an increase in successful recruitment of larvae and juveniles into the lake thus more organisms would have a chance to grow to maturity.

### 3.2.5 Essential Fish Habitat

Existing Conditions

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) (50 CFR 600) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 United States Code [USC] 1802(10); 50 CFR 600.10). The 1996 amendments to the MSA set forth a mandate for the NMFS of the NOAA, regional Fishery Management Council (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. A provision of the MSA requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan ([FMP] 16 USC 1853). Detailed information on federally managed species and their EFH is provided in the 2005 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC). The generic amendment was prepared as required by the MSA.

The IHNC, Lake Pontchartrain, and associated wetlands, canals, and bayous have been designated as EFH in the project vicinity for certain life stages of managed species. Subcategories of EFH identified in the project vicinity include non-vegetated, silty, fine sand, shell, and soft mud bottom, estuarine water column, with limited amounts of SAV and oysters, in the IHNC and in Lake Pontchartrain. Species managed by the MSA use this habitat for feeding, protection from predators, spawning, growth to maturity, and for migration to and from a variety of saline/brackish environments. They also use the IHNC, Rigolets, Chef Menteur Pass, and Bayou Bienvenue as conduits to travel to and from spawning grounds in the Gulf of Mexico and nursery areas in Lake Pontchartrain.

EFH species (eggs, larvae, juveniles, and adults) utilize the IHNC, Chef Menteur Pass, and The Rigolets as conduits to recruit to nursery areas. Larval life stages of EFH species use a tidal lateral behavior to move toward the center of flow during flood tides to migrate into Lake Pontchartrain through these three passes. Swenson and Chaung (1983) conducted studies on water volume exchange in estuarine systems and found that The Rigolets is primarily flood-dominated, whereas Chef Menteur Pass and the IHNC are primarily ebb-dominated. These findings are supported by the Hydrodynamic Validation modeling which found that under existing conditions velocities of ebb tides in the IHNC range from approximately 3 fps to 6 fps, versus flood tides which ranged from about 0 fps to 1 fps (validation modeling data used only one 24-hour period in October 2008 and no data was collected during peak flow conditions) (USACE 2009c). As a result of this information, it is reasonable to assume that larval transport into Lake Pontchartrain occurs mainly through The Rigolets, and transport out of the lake occurs through Chef Menteur Pass and the IHNC.

Additional habitat features that occur in the project area which may provide EFH for some species are two scour holes (figure 7), which are presently located approximately 300 ft to the north and 300 ft to the south of the Seabrook Bridge in Lake Pontchartrain and the IHNC, respectively. These deep depressions were likely the result of extreme storm event tidal flow into and out of Lake Pontchartrain. Also included topographically in this area is a dredge hole approximately 2,000 ft north of the bridge that covers an area of approximately 3 million sq ft. This dredge hole is approximately 30 ft to 60 ft deep and lies between the bulkhead of the New Orleans Lakefront Airport (east) and the seawall of the bank of Lake Pontchartrain on the west. The scour and dredge holes attract many recreationally-popular fish species and are particularly well known for spotted seatrout. The Seabrook area is known for catches of croaker, sand seatrout, red drum, black drum, mullet, shad, blue crab, and toadfish. Oysters have also been hooked from the fishing pier under the bridge.

SAV, which is often found within EFH areas, occur in the vicinity of the Tier 2 Pontchartrain project. Two SAV beds occur along the southern shore of the New Orleans East Area floodwall (IER #6) in Lake Pontchartrain (approximately 4 miles away from the project area) and on the eastern side of South Point heading toward Irish Bayou and Lake St. Catherine (approximately 15 miles away from the project area). Additionally, anecdotal information indicates that an eastern oyster population may exist at the mouth of the IHNC, which also attracts red drum and other fish species. This oyster population is also evident on man-made structures throughout Lake Pontchartrain (LaDWF 2009a). A more detailed discussion of SAV is provided in section 3.2.4, Aquatic Resources and Fisheries.

A population of the *Rangia* clam covers the bottom of Lake Pontchartrain and is an integral part of the local ecosystem. This clam species is found naturally burrowed into the mud over the entire lake bottom. It provides food for a variety of species such as red drum, black drum, and blue crab. Its most important function however, is its ability to continuously siphon water, which aids in maintaining good water quality in the lake. At their highest densities, the population would have the capacity to filter all the water in Lake Pontchartrain in approximately 3 days. Dredging of this clam in Lake Pontchartrain for its shell which was used in road construction and cement production occurred until its ban in 1990. Dredging operations conducted prior to 1990 suspended large amounts of silt from the mud bottom into the waters of Lake Pontchartrain and according to Michael Porrier with UNO (Porrier 2009), the population of *Rangia* clams in Lake Pontchartrain has been slow to recover.

Currently, *Rangia* clams exist in the entire lake except for a triangular area that spans from approximately the Orleans/Jefferson Parish line to the SAV beds at South Point near Irish Bayou and into the lake approximately 12 miles. *Rangia* clams are considered EFH because they provide 3-dimensional structure on the soft mud bottom which enhances the habitat for fishes. They are also eaten by the red drum and numerous prey species (such as black drum and blue crabs) which makes them an important link in the food web of Lake Pontchartrain. *Rangia* clams live in a wide range of salinity conditions but prefer low salinity habitats less than 6 ppt (USGS 2002b).

EFH in the project area has been designated for certain life stages of five managed species that commonly occur in the project area (table 11). Detailed information on federally managed EFH as it relates to EFH species in the project area is provided below. A more detailed description of wetlands and other components of aquatic habitats (*Rangia* clams, SAV, and oysters) are provided in sections 3.2.3 and 3.2.4.

**Table 11.**
**Life-Stages of Federally Managed Species that Commonly Occur within the Project Vicinity and the Associated Types of Designated EFH**

| Species | Life Stage | System * | EFH Zone and Habitat Type |
|---|---|---|---|
| **Brown shrimp** (*Farfantepenaeus aztecus*) | Eggs (no data available ) | M | sand/shell/soft bottom |
| | Larvae | M | planktonic, sand/shell/soft bottom, SAV, emergent marsh, oyster reef |
| | Juvenile (common) | E | SAV, sand/shell/soft bottom, emergent marsh, oyster reef |
| | Adult (rare) | M | SAV, sand/shell/soft bottom, emergent marsh, oyster reef |
| **White shrimp** (*Litopenaeus setiferus*) | Eggs (no data available) | M | Sand/shell/soft bottom |
| | Larvae | M | planktonic |
| | Juvenile (abundant) | E | SAV, soft bottom, emergent marsh |
| | Adult (rare) | M | Near shore and offshore sand/shell and soft bottom |
| **Pink Shrimp** (*Farfantepenaeus duorarum*) | Eggs (no data available) | M | sand/shell bottom |
| | Larvae (no data available) | M | planktonic, sand/shell bottom, SAV |
| | Juvenile (common) | E | sand/shell substrate |
| | Adults (rare) | M | Coarse sand/shell near SAV |
| **Red drum** (*Sciaenops ocellatus*) | Eggs (no data available) | M | Near shore pelagic |
| | Larvae/postlarvae (no data available) | E | all estuaries planktonic, SAV, sand/shell/soft bottom, emergent marsh |
| | Juvenile (common) | E/M | SAV, sand/shell/soft/hard bottom, emergent marsh, oyster reefs |
| | Adult (common) | M/E | SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh, oyster reefs |

*Source:* GMFMC 2004 and NMFS 2008.
* E = estuarine, M = marine.

Federally Managed Species

*Brown shrimp*

According to Pattillo et al. (1997) adult, juvenile, and larval brown shrimp are expected to occur in the project vicinity; however GMFMC (2004) records show that only juvenile life stages occur in this area. Juvenile brown shrimp are considered highly abundant to abundant within the project vicinity from April to October. Juveniles occur at higher abundances in high temperatures, low DO, moderately turbid, and mesohaline (5 ppt to 16 ppt) water (Jones et al. 2002; Baltz and Jones 2003). The density of post-larvae and juveniles is highest in emergent marsh edge habitat and SAV with soft substrates, and decreasing densities occur in intertidal creeks, inner marsh, shallow open water, and oyster reefs (Baltz et al. 1993; Clark et al. 2004; GMFMC 2004; Peterson and Turner 1994; Rakocinski et al. 1992).

There is a high probability that juvenile brown shrimp could occur within the estuarine open water in the project area and in SAV habitats located within the project vicinity. Both post-larval and juvenile life stages of brown shrimp are likely to use open water in the IHNC as a conduit to estuarine open water, emergent marsh, and SAV in Lake Pontchartrain. It is thought that this species occupies and migrates through the project from the Gulf of Mexico via; the GIWW and Lake Borgne, the Golden Triangle marsh, and Bayou Bienvenue. Prior to the construction of the closure at Bayou La Loutre, the MRGO most likely provided access for the largest number of organisms compared to the GIWW and Lake Borgne because of its direct route and strong tidal pulse.

Adult brown shrimp typically inhabit offshore waters (Pattillo et al. 1997) such as those off the coast of Louisiana. Although individual adults may occur within the project vicinity in open water habitat with turbid waters and soft sediments (Pattillo et al. 1997; Lassuy 1983c), adult brown shrimp are considered rare throughout the year in the project vicinity (GMFMC 2004). GMFMC (2004) maps show adult brown shrimp to be rare in Lake Pontchartrain and in the vicinity of the proposed action.

Brown shrimp postlarvae feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults prey primarily on amphipods, polychaetes, and chironomid larvae and would also feed on algae and detritus (Pattillo et al. 1997; Lassuy 1983c). Prey items of all life stages of brown shrimp are considered to be primary components of the trophic spectrum in Lake Pontchartrain (Darnell 1961).

Brown shrimp post-larvae have been found at salinities ranging from 0.1 ppt to 69 ppt and larger juveniles prefer 10 ppt to 20 ppt (Pattillo et al. 1997). The optimum salinity range for adults is between 24 ppt to 39 ppt.

*White shrimp*

Adult white shrimp are expected to occur in the project vicinity (Pattillo et al. 1997) on a seasonal basis (GMFMC 2004) and juvenile white shrimp are common to abundant within the project vicinity from July through October (GMFMC 2004). Post-larval white shrimp seek shallow, estuarine water with muddy sand bottoms high in organic detritus or vegetative cover; while juvenile white shrimp inhabit turbid estuaries, marsh edges, and SAV (Pattillo et al. 1997). Post-larval white shrimp use soft muddy or peat-like bottoms for burrowing (Muncy 1984). White shrimp can be replaced by brown shrimp in muddy areas due to competition for habitat (Muncy 1984). GMFMC (2004) maps show adult white shrimp habitat to include Irish Bayou, Lake Catherine, Lake Borgne, and the eastern shore of Lake Pontchartrain; however, juveniles are common to highly abundant throughout Lake Pontchartrain. Both post-larval and juvenile life stages of white shrimp are likely to use open water in the IHNC as a conduit to estuarine open water, emergent marsh, and SAV in Lake Pontchartrain all year.

Like brown shrimp, post-larval white shrimp feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults prey on amphipods, polychaetes, and chironomid larvae and also consume algae and detritus (Pattillo et al. 1997) which are considered primary components of the trophic spectrum in Lake Pontchartrain (Darnell 1961).

White shrimp prefer a mesohaline salinity regime with post-larvae and juveniles preferring lower salinity habitats (6 ppt to 8 ppt) and larger late juvenile stage individuals preferring brackish habitats (10 ppt to 18 ppt) (figures 34 and 35). Based on these habitat preferences, juvenile white shrimp are expected to use bayous, canals and inlets such as the GIWW, the IHNC, Bayou Bienvenue, Rigolets, and Chef Menteur Pass to reach nursery areas in Lake Pontchartrain.

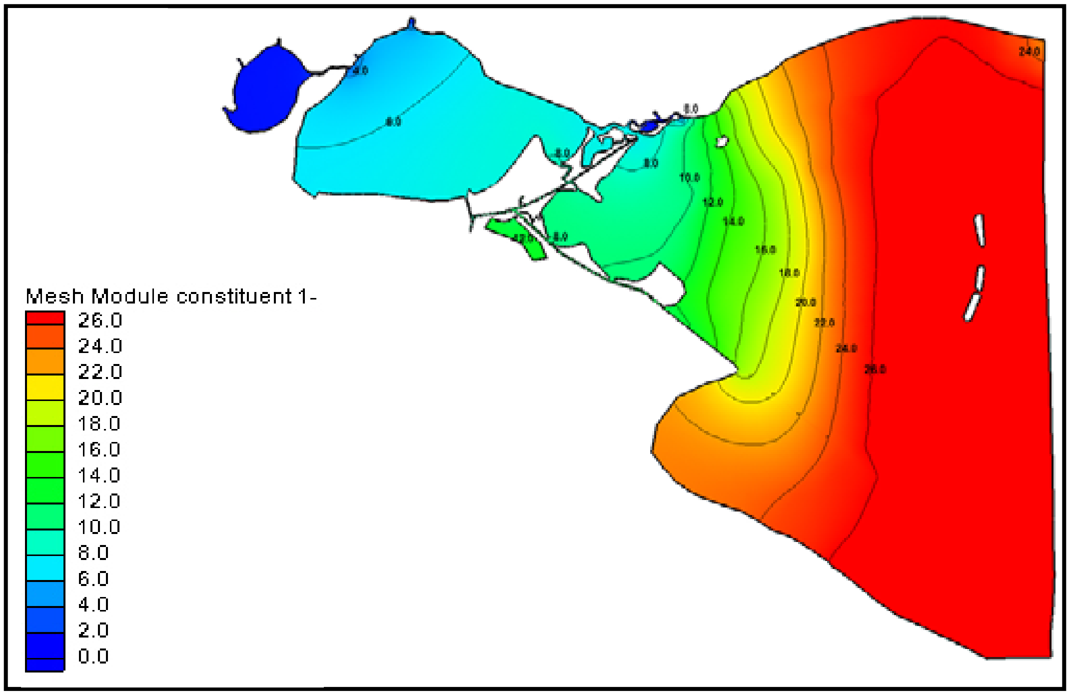



**Figure 34. Base Isohalines Predicted for March 2006 (Martin et al. 2009b)**

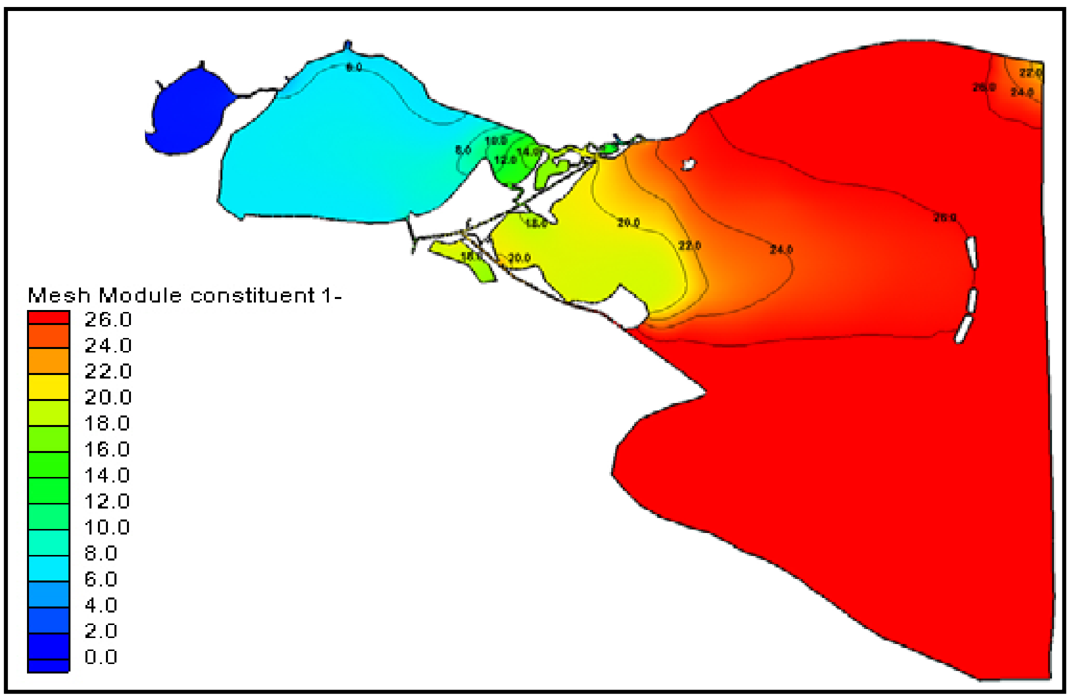



**Figure 35. Base Isohalines Predicted for September 2006 (Martin et al. 2009b)**

*Pink Shrimp*

According to GMFMC (2004), juvenile pink shrimp are expected to occur in the project vicinity; however, Pattillo et al. (1997) indicate occurrences are rare. Juveniles may prefer SAV meadows where they burrow into coarse substrate; postlarvae prefer a mixture of course sand/shell/mud and immature stages are found on substrates with vegetative detritus. Although densities of pink shrimp are considered highest in SAV habitat by Pattillo et al. (1997), the GMFMC (2004) clarifies that juveniles prefer high salinity SAV over the low salinity SAV which is found in Lake Pontchartrain. Therefore, even though two SAV beds occur within the project vicinity, one along the south shore of the New Orleans East Area HSDRRS in Lake Pontchartrain and the other on the eastern side of South Point heading toward Lake St. Catherine (figure 28), juvenile pink shrimp may not utilize these SAV beds, and therefore, may not rely on Seabrook as a conduit to Lake Pontchartrain. However, GMFMC (2004) still records juvenile pink shrimp as common throughout the year in Lake Pontchartrain, while adult occurrences are rare.

Postlarvae feed on phytoplankton, zooplankton, epiphytes, and detritus. Juveniles and adults consume algae and detritus, which are considered primary components of the trophic spectrum in Lake Pontchartrain (Darnell 1961), and prey on amphipods, polychaetes, and chironomid larvae (Pattillo et al. 1997).

*Red drum*

Adult and juvenile red drum utilize a variety of habitats in the project vicinity. Adults are common April through October (GMFMC 2004) and juvenile red drum are common to abundant in the project vicinity's shallow open water and brackish emergent marsh habitats year-round (GMFMC 2004; Nelson et al. 1992). Adult red drum, while not expected to occur in the project vicinity (Nelson et al. 1992), may occur in the scour holes north and south of the Seabrook bridge, in emergent marsh in Lake Pontchartrain and in open waters and emergent marsh within and adjacent to the GIWW, the IHNC, the MRGO, and in the Golden Triangle marsh.

Spawning typically occurs outside the project vicinity (GMFMC 2004) in deeper water near the mouths of bays and inlets (Pearson 1929) near the Gulf of Mexico. Planktonic red drum larvae are carried by currents into bays and estuaries (Peters and McMichael 1987), such as Lake Pontchartrain, where they settle into the tidally-influenced emergent wetlands (Stunz et al. 2002a). Juvenile red drum are expected to use bayous, canals and inlets such as the GIWW, the IHNC, Bayou Bienvenue, Rigolets, and Chef Menteur Pass to reach nursery areas in Lake Pontchartrain. Juvenile red drum prefer specific habitat types, occurring at higher densities in SAV (Stunz et al. 2002a), growing faster there and in brackish emergent marsh and oyster reefs (Stunz et al. 2002b). Additionally, juvenile red drum prefer a mesohaline (5 ppt to 16 ppt) to euryhaline salinity regime (16 ppt to 36 ppt) and growth rates are highest between 18.3°C and 31.0 ºC (GMFMC 2004).

Red drum are considered predators in estuaries and Lake Pontchartrain is considered an area of high abundance of the red drum (Reagan 1985). They are considered intermediate feeders due to their use of the bottom for foraging (eat oysters, clams and blue crabs) as well as the pelagic habitat to hunt for prey fish species. Locally in Louisiana, red drum are also known for their love of crabs (LaDWF 2009b). Juvenile red drum showed preferences for fish, crabs and shrimp, particularly mysid shrimp (Reagan 1985). Adult red drum feed primarily on fish, shrimp, and crabs. Fish prey, primarily menhaden and anchovies, are most important in the winter and spring, while crabs and shrimp are important in the summer and fall (Reagan 1985).

<u>Various Other Species of Importance</u>

In addition to the species discussed previously, coastal wetlands within the project vicinity provide nursery and foraging habitat for other economically important marine species like blue crab, bay anchovy, Gulf menhaden, striped mullet, Atlantic croaker, spotted seatrout, sand seatrout, black drum, and southern flounder. Various developmental stages of most of these species serve as prey for other fish species managed under the MSA by the GMFMC (e.g.

mackerels, snappers, groupers) and highly migratory species managed by NMFS (e.g. billfishes and sharks, dolphin). Fishes that serve as prey for these managed species were discussed in more detail in the Aquatic Resources and Fisheries section (3.2.4).

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to EFH*

Direct impacts to EFH would occur due to changes in salinity, DO, passage during and following construction, and estuarine substrate (including sand/shell and mud bottom) from filling the south scour hole and due to changing approximately 7 acres of estuarine open water areas to floodwall and gate structures and associated ROW. Even though the IHNC is a man-made shipping channel with bulkheads along the shoreline and has been previously dredged, it currently serves as a major conduit between the Gulf of Mexico and Lake Pontchartrain for many species managed by the MSA, and is considered EFH. Significant alterations to this conduit could cause positive and negative impacts to EFH including breeding, transport/migration, and growth to maturity. The proposed action would not be expected to have any direct impacts to SAV.

During construction, specifically activities related to filling in the scour hole and installing the cofferdam, there would be potential for burial and/or suffocation of benthic organisms such as polychaetes, oysters, and *Rangia* clams that occur in the footprint. Mobile organisms such as shrimps, fishes, and crabs would be expected to move from the area, but still have the potential of being buried. Impacts from suffocation and burial would only occur during filling activities. Once filled, that deepwater habitat would be permanently lost. Presently, large spotted seatrout are found in the Seabrook bridge area most likely due to the presence of the scour holes. Since deep water habitat is sparse in the project vicinity, loss of this habitat may cause changes in seasonal behavior, feeding behavior and growth rates of larger fishes that utilize this habitat. Conversely, the cofferdam could also concentrate prey items, thus attracting larger fish/predators to the area; however, the poor water quality in the vicinity of the cofferdam may negate fish from taking advantage of this opportunity.

During construction, a braced cofferdam would be temporarily installed across the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. During this phase of construction the IHNC would be closed to flow.

While the cofferdam is in place, the IHNC would be dammed and no water would flow between the IHNC and Lake Pontchartrain, thereby impeding the movement and transport of organisms and access and relative use of habitats designated as EFH within Lake Pontchartrain. The duration of this construction phase would impact at least one life cycle of EFH species because larvae and juveniles moving along the GIWW, Bayou Bienvenue/MRGO north of the Bayou Bienvenue closure would be unable to enter Lake Pontchartrain through the IHNC. The life cycle of these organisms depends on reaching the lower salinity waters of Lake Pontchartrain and various habitat types in the lake. Although two conduits (Chef Menteur Pass and the Rigolets) would remain open and organisms could use these as access points to reach nursery areas in the lake, individuals transported to the INHC during this time would most likely be unable to travel against the directional flow through the GIWW toward Chef Menteur Pass or Rigolets. Therefore, larvae would most likely not recruit to Lake Pontchartrain nursery areas.

Mobile organisms (e.g. shrimp, crabs, and fish) may have a longer travel time to reach appropriate salinities which support EFH where suitable prey items may be found. Migrating species may use salinity gradients as well as tidal flow to sense direction to the Gulf of Mexico. These species may make a smoother transition into and out of the lake provided there is an abundance of suitable prey and SAV to sustain the additional numbers of individuals using Chef Menteur Pass and the Rigolets. Once the proposed action is complete, the Seabrook gate structures would allow EFH species into and out of Lake Pontchartrain except during storm events, high flow events, and monthly OMRR&R. These infrequent closures would be temporary and should have a minimal effect on migration and transport of EFH species. If closure periods coincide with monthly peak tides and species migration, adverse impacts may occur.

Closure of the IHNC while the cofferdam is in place may cause larvae, juveniles, and prey items to become unable to exit the IHNC and find an alternate route to a suitable supply of food, potentially resulting in starvation and/or heightened predation. These dietary and behavioral impacts could cause decreases in populations of lower trophic level species, and in turn, the species that rely on them entering Lake Pontchartrain. For example, blue crab migration into Lake Pontchartrain specifically occurs from May to June through the IHNC. This influx of larvae would be disrupted by the construction phase of the project and specifically while the cofferdam is in place (approximately 6 months to 12 months) which could overlap with more than one breeding cycle of this species. This would affect juvenile and adult populations of EFH species (mainly red drum) that rely on blue crabs for feeding. This would require predators to travel longer distances during the construction period, extending an already lengthy trip and potentially resulting in decreased growth rates and inability to reproduce of some individual EFH species, particularly red drum. Conversely, some species that use internal and external cues to sense changes in flow, salinity, or tidal movement would still be able to use these cues to migrate to alternate nursery area such as the southeastern portion of Lake Pontchartrain (via Chef Menteur Pass or the Rigolets) or into Lake Borgne. Further discussion on internal and external cues used by organisms to migrate to nursery areas is located in section 3.2.4 (Aquatic Resources and Fisheries).

Disturbance would occur to some sessile and mobile organisms as the area inside the cofferdam is dewatered. This construction activity may cause mortality to populations of organisms trapped in the cofferdam. Construction operations would be designed and BMPs employed to help fish and invertebrate species to avoid and escape the cofferdam at the time of placement to the maximum extent possible. Placement of riprap outside the retaining walls may cause burial of additional individuals; however this construction activity would be short-term.

Noise and vibration from construction activities within areas designated as EFH would most likely deter many organisms including predatory fish from the project area during construction. Sessile benthic organisms that reside in the project area, and cannot remove themselves from noise and vibration would be impacted. These negative impacts could range from stress that prevents them from feeding to death from cracked shells due to vibration. Noise occurring from construction activities could cause behavioral changes and sub-lethal impairments to the hearing of mobile organisms (including some EFH species [Hastings and Popper 2005]). Although there may be mortality to individuals of EFH species during construction activities for the proposed alignment, the number affected would not be expected to impact populations of EFH species since most individuals would be expected to move away from the impacted area. Immature stages of EFH species such as eggs, larva and juveniles of red drum and all life stages of shrimps may be impacted more than adult red drum because of the greater travel time required by most small organisms. Although these impacts would be temporary, the duration of impacts may extend for approximately 36 months.

After the proposed action is in place, the replacement of existing open water by floodwall and gate structures would culminate in narrowing the opening of the IHNC from 250 ft to three openings that total 195 ft in width. Although the width of the channel is reduced, design of the gate structures allows for a 3,000 sq ft to 3,500 sq ft flow area to be maintained, which hydraulic modeling has indicated results in velocities similar to those experienced historically within the IHNC.

To assess access of managed species to EFH, ERDC has completed PTM to help predict the range of impacts of the proposed action for eight species of prey and predatory fish and invertebrates that utilize Lake Pontchartrain and surrounding waters during their life cycle (USACE 2009c). These species include four EFH species of this area (brown shrimp, white shrimp and red drum). In the model, managed species for which EFH has been designated EFH were given a behavior type based on actual behaviors used to recruit to nursery areas. Red drum, white shrimp, and brown shrimp were all designated as tidal lateral movers. Other conditions and limits of this model are described in section 3.2.4 (Aquatic Resources and Fisheries).

PTM for impacts on larval migration within the GIWW/INHC system indicates that after flow is restored at Seabrook, larvae will predominantly migrate from Lake Borgne into Lake Pontchartrain via the Rigolets and Chef Menteur Pass, and the GIWW due to placement of the MRGO closure at La Loutre and the Borgne structures; however the dominant pass utilized is highly dependent on the initiation point of the particles (Lake Borgne versus the GIWW) and the model designated direction of incoming tidal flow (east versus west) (USACE 2009c).

In the model runs, particles were initiated in several locations (MRGO, the GIWW, and Lake Borgne), but this discussion will focus on the Lake Borgne and the GIWW initiation cases. Incoming tidal flow was also set as east or west because of the dynamics of the system. The initiation points of the larval organism-like particles (GIWW or Lake Borgne) and the direction on the incoming tide both have an impact on the predicted percentage of recruitment into Lake Pontchartrain after the Seabrook project is complete.

According to USACE (2009c), there is no predicted impact on the recruitment of larval organisms when particles are initiated in Lake Borgne (change in of < 1 percent). However, when particles are initiated in GIWW and incoming tide in the GIWW is west, recruitment declines 7.81 percent in September (49.86 percent to 42.05 percent) and 6 percent in March (57.58 percent to 51.58 percent; USACE 2009c). The majority of the particles recruit into Lake Pontchartrain via the IHNC with most of the impact occurring to tidal lateral behavior types (e.g. brown shrimp, white shrimp, Gulf menhaden, bay anchovy and red drum). When particles are initiated in GIWW and incoming tide in the GIWW is east, recruitment also declines 9.77 percent in September (33.72 percent to 23.95 percent) and 7.56 percent in March (32.79 percent to 25.23 percent; USACE 2009c). The majority of the particles recruit into Lake Pontchartrain via Chef Menteur Pass with most of the impact occurring to both bottom movers (e.g. Atlantic croaker) and tidal lateral behavior types (e.g. brown shrimp, white shrimp, Gulf menhaden, bay anchovy and red drum). The somewhat larger decline in recruitment with the east incoming tide could be due to the time and distance associated recruiting through Chef Menteur Pass. This predicted 6 percent to 10 percent decline in recruitment could have some direct impact to the overall population of these organisms because fewer organisms would occur in the system by altering access to designated EFH (USACE 2009c).

Given the predicted decline in recruitment, the proposed action would reduce productivity of EFH species (eggs, larvae, juveniles, and adults) which utilize the three passes (IHNC, Chef Menteur Pass, and the Rigolets) as conduits to recruit to nursery areas. Any reduction in tidal flows or changes in flow direction result in longer travel times and lower migration opportunities for EFH species. Larvae subjected to longer travel times may be in poor condition and exhibit higher respiration rates, slower growth rates, have less ability to find adequate prey, hide from predators and grow to maturity. If tidal flow is reduced through the IHNC, even though modeling results show that fewer organisms would be recruited in through the three passes, the greatest impacts could occur from juvenile and sub-adult EFH species migrating from the lake to the Gulf of Mexico.

*Indirect Impacts to EFH*

The proposed action would have both temporary and long-term (permanent) indirect impacts to EFH and species with designated EFH in the project area. These impacts would be expected to occur during construction activities (approximately 36 months) due to substantial changes in water quality (turbidity, salinity, and DO levels) and velocities, specifically for the 6 months to 12 months that the cofferdam is blocking flow in the IHNC. After construction is complete, continued changes in velocities and salinities are predicted, but changes in velocity would be relatively minor the majority of the time (see discussion of velocity below). However, during closure periods, fish passage would be blocked. The relative degree of these impacts could be heightened if closures happen to coincide with monthly high tides and peak migration.

Siltation from filling the scour hole, constructing the cofferdam, and other construction activities could choke benthic organisms and create difficulty for predators and other organisms that depend on vision in order to capture prey. Siltation plumes of long duration could stress and kill benthic fauna. Diminished sunlight penetration may affect phytoplankton populations in the project area. Both these disturbances would impact EFH designated species in the project area by decreasing the abundance and variety of prey available, as well as their ability to catch prey. These impacts would be expected to be considerable while the scour hole is being filled and during construction of the cofferdam, even though BMPs would be used to the maximum extent possible. These indirect impacts would only occur for a short time. Although some increased turbidity levels are expected for the duration of construction, these increases would be less than turbidity levels expected during filling the scour hole and constructing the cofferdam, and therefore would not be considerable.

<u>Dissolved Oxygen</u>

DO modeling for the construction scenario and operation scenario was conducted to predict changes in DO from the implementation of various projects in the project vicinity. Modeling conditions, limitations and results are discussed in detail in section 3.2.2 (Water Quality).

Indirect impacts to EFH and EFH species may occur during construction due to changes in water characteristics. Impacts would most likely be temporary and caused by the displacement of organisms from localized areas due to elevated turbidity levels, decreased DO, and increased BOD associated with construction dredging and filling activities. The current DO concentrations in the IHNC are low especially near the bottom of the water column and in the scour hole under existing conditions. If conditions worsen during construction (specifically while the cofferdam is in place), most organisms would be expected to relocate until construction activities are complete; however, long-term depressed DO levels (during construction) in the project area may lead to behavioral changes, decreased growth rates, and decreased survivability in some EFH and EFH species. Sessile organisms would be expected to be negatively influenced greatly during construction. Organisms that are not buried during excavation and fill activities could be suffocated and could have to overcome 6 months to 12 months of low DO concentrations. It is possible that the IHNC could become a "dead zone" for sessile organisms until the proposed action is complete. Discussions and conclusions in this document are based on results of recent modeling. Additional modeling and monitoring is currently being investigated for the CED.

The temporary blockage of the IHNC has the potential to cause fish kills north and south of the cofferdam as a result of lower DO conditions. Although fish kills have been documented along the south shore of Lake Pontchartrain during August and September, the impacts from the cofferdam are expected to be greater than impacts that have been documented in the past. Low DO levels have been documented at the closure of the MRGO at Bayou La Loutre. If kills do occur they would be caused by the persistent low DO levels that can result from blocked flow. These would only occur while the cofferdam is in place. If fish kills occur, they would cause similar results to EFH (e.g., *Rangia* clams), EFH species (e.g. shrimps) and their prey items (e.g. crabs). It is improbable that the number of individuals killed would have an impact on the overall populations of these species. However, if large numbers of individuals are killed, populations would rebound within several years as the system comes to a new equilibrium from all the other ongoing projects in the area.

Filling the scour hole south of the Seabrook Bridge may cause permanent beneficial changes to DO levels in the IHNC after construction is complete and has the potential to ultimately improve water quality conditions in the project area. The beneficial impact of improving DO concentrations in the IHNC may result in organisms using less energy for respiration, which would allow them to allocate more energy to find food, hide from predators, or travel to nursery areas or spawning grounds. While DO may improve in the IHNC, other factors such as velocity may still inhibit the ability of organisms to traverse the IHNC successfully.

<u>Salinity</u>

TABS–MDS hydrodynamic numerical model (Tate et al. 2002) used for salinity modeling was conducted by ERDC to predict changes in salinity in the project vicinity (Martin et al. 2009). Modeling conditions, limitations and results are discussed in detail in section 3.2.2 (Water Quality).

Temporary and permanent impacts from localized alterations in salinity could occur in open-water areas as a result of new flood control alignment at Seabrook. These impacts could result from the constriction of freshwater influx and tidal flow through the IHNC from both sides of the gate structures. With the MRGO closure at La Loutre in place, salt water intrusion from this source is already blocked. Modeling showed that salinity within the GIWW and the IHNC would be slightly diminished long-term. Maximum direct changes to salinity in the project area are expected to be less than a 1 ppt decrease. This predicted change in salinity should not impact EFH or EFH species as long as individuals are healthy. Some circumstances in which organisms may be impacted by 1.0 ppt change in salinity are: (1) the organism is already more vulnerable, i.e., weakened, stressed or diseased, (2) the organism is a sessile type (such as oysters, *Rangia* clams or barnacles), is located in an area with existing conditions near its optimal or lethal threshold, or may already inhabit a stressed environment, or (3) the resulting salinity causes important changes in types or quantity of prey available or predator-prey interactions. Impacts should not occur to populations of species with designated EFH in the project area. It is more likely that individual aquatic organisms may be impacted under the conditions described previously. Additionally, 1.0 ppt changes in salinity occur under natural estuarine conditions throughout tidal cycles and seasons; therefore, it is likely that organisms in the IHNC are already adapted to this type of salinity flux.

Lack of flow between the IHNC and Lake Pontchartrain while the cofferdam is in place could change salinities to the north of the project area, and therefore, alter water quality parameters and benthic habitat. Alterations could include potential benefits to benthic habitats and communities (prey items such as blue crabs, *Rangia* clams) in the southeastern portion of the lake. Due to the MRGO closure, much of this salinity alteration may already have occurred (Porrier 2009). Changes to salinity could also cause stress and behavioral changes to EFH species and their prey which may lead to increased predation in the vicinity of the project area.

Partially filling the scour hole in the IHNC may result in positive changes to salinity in this area of the IHNC by removing a sink for heavier saline water to be trapped. However, loss of this habitat may be more important as refuge for fish populations.

Organisms which utilize tidal flow and salinity gradients for passage may follow the altered gradients to the Rigolets and Chef Menteur Pass instead to access nursery and breeding grounds closer to the Gulf of Mexico. Marsh areas such as those near Bayou Bienvenue, which may already contain altered salinity due to the MRGO closure at La Loutre, may be less accessible for organisms due to changes in tidal velocity and passage constraints. Alternatively, changes to tidal flow within the GIWW due to the MRGO closure at La Loutre may make traversing this reach of the waterway more direct since the sloshing effect from several waterway influences would have been alleviated (see Hydrodynamics Modeling Report, USACE 2009e). SAV beds (EFH) occurring on the eastern shore of Lake Pontchartrain (approximately 4 miles from the project area), may be positively affected by salinity changes and negatively affected by potential for increased use by organisms. If carrying capacity has been reached in the foraging and nursery areas of northeastern portions of Lake Pontchartrain, then additional population loads may be disadvantageous. Additional organisms or entire populations could increase resource pressure during the construction period and cause permanent effects to population numbers.

Velocity

ADH modeling was conducted by ERDC to predict velocities in the proposed action area. Modeling scenarios are reported in positive and negative numbers to demonstrate flood and ebb tidal movement (USACE 2009c). Modeling conditions with the MRGO closed and the Borgne Barrier in place are discussed in detail in section 3.2.1 (Hydrology).

During construction, velocity and circulation would be cut off between Lake Pontchartrain and the IHNC by the placement of a cofferdam that would span the width of the channel for approximately 6 months to 12 months of the construction sequence. Lack of passage between the IHNC and Lake Pontchartrain while the cofferdam is in place would have adverse effects on transport and migratory patterns of EFH species and their prey. This would affect populations of EFH species and their prey which migrate to nursery habitats via the IHNC.

During the additional 24 months to 30 months of construction (IHNC at least partially open), velocities are expected to remain below historical conditions the majority of the time; however, velocities through the GIWW barge gate could increase up to 5.03 fps in September, and up to -6.30 fps in March (USACE 2009c). EFH species and their prey are expected to be negatively impacted during these times of high velocity. Impacts could range from stress and behavioral changes that could lead to increased predation rates and decreased growth rates to burial of some individuals.

With the proposed action in place, modeled results show that velocities exceed 2.6 fps in the IHNC 40 percent of the time under September conditions, and 55 percent of the time under March conditions (figures 29 and 30). Velocities greater than 2.6 fps can inhibit fish passage and could cause adverse impacts to fish and other swimming organisms. Given these results, the proposed action could be manageable for larger fishes (>300mm) but could be difficult for smaller fishes (<100 mm) and macroinvertebrates (such as blue crabs) to traverse the gate at IHNC, and zooplankton (10 cm/sec) (Smith 2008). Therefore, fish movement through the gate could fluctuate with tides and weather events. During some weather or tidal events, conditions could occur that would hinder fish and macroinvertebrate movement; however, due to the existing human alterations to the project area, fish and invertebrates were most likely exposed to unfavorable conditions for passage under historical conditions (before the MRGO closure at La Loutre and the Borgne Barrier were constructed).

The proposed sector gate and two vertical lift gates would remain open except during extreme storm events, high flow events, and routine maintenance. Once the Seabrook gates are in place, operation of the gates approximately 10 times a year would be necessary to control/reduce velocities experienced at the gates on the GIWW for safe navigation. While the gates are open, these structures would not significantly reduce flows, water surface elevations, or the tidal prism in the IHNC. Modeling conducted by USACE (2009c) indicates no detectable changes between the historical conditions and the proposed action conditions with all three gates open. The sector gate would be designed to allow flows to pass smoothly with minimal turbulence. The addition of the vertical lift gates on either side of the sector gate should also mitigate any turbulence caused by the gate itself.

After project completion, larval forms are expected to emerge into Lake Pontchartrain predominantly through the northeastern passes as the result of tidal flow, thereby affecting species using designated EFH. Although the Rigolets and Chef Menteur Pass are also viable options for passage into Lake Borgne, mobile organisms (shrimp and fish) may have a longer travel time to reach areas of appropriate salinity that support suitable prey items. The blind end in the IHNC temporarily created by construction activities may trap migrating life forms and prevent successful recruitment into Lake Pontchartrain. Even though tidal influences would still affect this area, survival of organisms until access is available or an alternate pathway is reached may not be feasible. This could be especially important for the blue crab fishery which is also an important prey item for species with designated EFH such as the red drum.

*Cumulative Impacts to EFH*

Cumulative impacts from the proposed action would involve the combined effects from the multiple IER projects and CWPPRA projects throughout the area; the Violet freshwater diversion project; MRGO closure at La Loutre, and several other wetland restoration projects (that would reduce potential adverse cumulative impacts by positively affecting the EFH within the project area). While these restoration projects would help to offset habitat loss from the proposed action, restoration projects are largely aimed at creating wetlands and not deep water habitat that would be lost with the proposed action. However, the combined restoration projects would enhance marsh edge and shallow water habitat which have been shown to be more productive than habitats currently found in the project area, therefore the overall long-term net effect could be positive. In addition, the Violet freshwater diversion project would further lower the salinities of the marsh behind the structure. The combined effects of other projects including the Borgne Barrier, the closure of the MRGO at Bayou La Loutre, and the Violet Diversion would result in varying degrees of altered hydrology, salinity, DO, and velocities throughout the project area. Direct and indirect changes from the proposed action are discussed previously but the changes from the combination of IER and CWPPRA projects would lead to substantial long-term cumulative impacts to EFH and EFH species throughout the project area and vicinity.

Potential cumulative impacts to EFH and EFH species with designated EFH in the project vicinity could occur from construction-related activities (e.g., turbidity from excavating and placing fill material, noise) and from the various other on-going, completed, and authorized projects (e.g., changes in salinity, velocity, and circulation/flow). Despite previous disturbances in the vicinity of the proposed action including the construction and maintenance of navigable waterways and existing HSDRRS, the proposed action would result in both beneficial (improving salinity, DO concentrations in some areas) and adverse impacts (temporary and permanent decrease in dispersion of organisms) to EFH and EFH species and their prey.

The proposed action, in combination with other projects, would have both positive and negative cumulative impacts to EFH and EFH species. Changes in salinity would occur from closure of the MRGO at Bayou La Loutre, the Borgne Barrier and from the proposed action. Modeling conducted by ERDC illustrated that the closure of the MRGO at Bayou La Loutre would have a significant effect on monthly average bottom salinity values not only in MRGO/GIWW/IHNC, but also in the Lake Borgne area and in some areas of Lake Pontchartrain. Most areas showed decreases of 3 ppt to 4 ppt, with MRGO showing the highest decrease in the region just north of the La Loutre closure at approximately 10 ppt (Martin et al. 2009b). The cumulative impact of the MRGO closure at Bayou La Loutre, the Borgne Barrier, and the proposed action is an overall decrease in salinity in the project area of approximately 0.25 ppt to 0.45 ppt.

The overall change to salinity could be both positive and negative to EFH and EFH species. It is expected that environmental conditions would become restored to those closer to historical conditions (e.g., pre-MRGO) including a more freshwater/brackish system. The predominately saline Golden Triangle marsh is expected to be altered to a lower salinity/brackish environment. Although salinity could resemble conditions prior to the dredging of the MRGO, species inhabiting the project vicinity are accustomed to salinity conditions prior to the implementation of these projects and these conditions would impact the existing habitats and resources as organisms adapt to the new environmental conditions. Reductions in salinity would impact the existing system in the short-term by creating localized community and habitat shifts, a disconnection between predators and prey species, changes in behavior, decreased growth rates, and shifts in populations of some species. Although the initial impact may be adverse and pronounced, it is expected to be beneficial in the long-term since the overall value of wetlands for EFH may be more productive after the ecosystem is restored to less saline conditions.

Dispersion of all life stages of organisms (such as red drum, white shrimp, and brown shrimp) and their prey species would experience an additive negative effect from the MRGO closure at La Loutre, the Borgne Barrier, and the proposed action. Organisms would be unable to use the MGRO and Golden Triangle marsh except for a small opening at Bayou Bienvenue for transport or migration into Lake Pontchartrain; however, the IHNC via the GIWW (except for approximately 6 months to 12 months during construction of the proposed action) and two passes in the eastern portion of the lake would be available. Even though larval transport and migration of other life stages may be reduced into Lake Pontchartrain through the IHNC, organisms could see a benefit from the overall change in flow direction from the implementation of MRGO closure at La Loutre, the Borgne barrier, and the proposed action. If organisms used alternate routes such as the Rigolets and Chef Menteur Pass to enter Lake Pontchartrain, they could enter and settle out in the east portion of Lake Pontchartrain, which contains more abundant high quality habitat, including natural shorelines bordered with complex habitat mosaics (SAV, *Rangia* and oyster shells, and emergent marsh). Recruiting into a higher quality habitat could result in higher growth rates, less predation, and a greater chance of individuals successfully growing to maturity and spawning. However, if carrying capacity has already been reached, then the required transitory migration of additional organisms into this area could create pressure on resources due to competition and overuse. This could be disadvantageous to all species (including EFH species) that utilize this ecosystem.

For 6 months to 12 months during construction of the proposed action a cofferdam would block flow between the IHNC and Lake Pontchartrain. Additionally, the timing of the construction sequence of Seabrook and various features of the Borgne project including the GIWW sector gate and Bayou Bienvenue gate may overlap for up to 11 months. The GIWW will still allow flow and navigation through the gate during this phase of construction, but the channel opening will be constricted from 300 ft to 150 ft. A cofferdam will be placed at Bayou Bienvenue constricting the flow to four 48-inch culverts. The cofferdam at Seabrook, along with the constriction on the GIWW and cofferdam at Bayou Bienvenue (closed except four 48-inch culverts to allow some flow) would severely restrict access of species with designated EFH and their prey items to quality habitat. This restriction could cause an increase in predation of some lower trophic level species and change available prey items to predators, and cause predators to travel longer distances during construction and would extend an already lengthy trip, thereby decreasing growth rates, overall health, and possibly the ability of some individuals to reproduce.

These temporary constrictions previously discussed may result in fish kills. Fish kills in multiple areas within the project vicinity would impact a larger number of individuals that have been impacted at the Bayou La Loutre closure alone. Fish kills in these areas could cause slower growth rates in individuals subjected to this environment, and would decrease the survival rate of some species, thereby causing changes in overall community structure near the closures, and contributing to poor year classes for some populations. Greater impacts are expected from the MRGO closure due to the higher salinities and deeper water depth in the area as compared to the proposed action.

One possible positive benefit of the closures along the MRGO, the Borgne Barrier, and the proposed action would be that the Golden Triangle marsh and associated canals would become less saline which would return to salinity levels closer to historic, pre-MRGO levels. This overall freshening of water conditions is predicted to increase habitat value in the project vicinity which could assist in increasing the productivity of some EFH species. However, this potential increase in productivity could be minimized or changed due to interactions between the freshening predicted to occur and the subsidence of wetlands, and predicted relative sea level rise that is expected to occur. How these interactions would impact EFH, species with designated EFH, and their prey is currently a data gap and is discussed in the section 1.6 (Data gaps and Uncertainty).

Multiple gate structures and barriers across the Golden Triangle would alter tidal flow in the system thus increasing travel times for tidally dependent organisms. This would have negative impacts to the recruitment of some EFH species into Lake Pontchartrain. Hare et al. (2005) concluded that wind forcing, residual bottom inflow, and selective tidal stream transport are responsible for the ingress of larval fishes into the Chesapeake Bay, an estuary with similar species composition and abiotic conditions. The relative importance of the three mechanisms differs among changes with larval development with tidal mechanisms becoming more important as individuals grow in size. USACE (2009c) PTM predicted that the cumulative impact would be a 6 percent to 10 percent decline in larval recruitment during March, and a 3 percent to 7 percent decline during September for all behavior types when simulation particles are released from Lake Borgne. Tidal lateral movers (red drum, white shrimp, and brown shrimp) experienced the largest decline in recruitment as compared to tidal vertical, bottom, and passive movers. This decline would be experienced equally through both Chef Menteur Pass and the IHNC. These results suggest that species with designated EFH may be more impacted by the reduction in tidal flow as compared to other species such as blue crab, spotted seatrout, and Atlantic croaker. If this reduction in recruitment does occur, Lake Pontchartrain could experience an overall decrease in population numbers and impact to overall life cycle stages of several species that play key roles in the community structure and provide a commercial industry for fishing.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to EFH*

Overall, direct impacts to EFH would be similar to those discussed under the proposed action; alternative #2 would impact the same total area of open water as the proposed action, approximately 9 acres (permanent and temporary impacts). Similar to the proposed action, the south scour hole would require partial filling, however less additional riprap and scour protection would be required under alternative #2, which would result in fewer construction-related impacts. Because the alternative #2 alignment would not directly cross the scour hole, it therefore would not require as much fill for the hole as would be necessary under the proposed action. Thus, under alternative #2, the scour hole would still provide some deep water habitat in the IHNC, but would not have the same beneficial impacts of improved DO and salinity conditions.

The alternative #2 alignment may trap water between its structures and the railroad bridge. The obstruction created by the gate placement near the Seabrook Bridge could provide “protected” areas in the vicinity of the structure for some organisms, but could also create a trap or gyre for many organisms which do not have sufficient control to manage any resulting eddies. Sloping the sill and directing the water flow through the center of the channel is intended to decrease this impact as well as reduce bank erosion. Depletion of food stores and increased predation stress could result. Resulting impacts could range from changes in behavior to slower growth rates to starvation and death and increased predation mortality. These impacts would be minimized and possibly negated if a training wall was designed and installed to prevent eddies and gyres. These design features would be utilized to the maximum extent possible.

Temporary impacts to EFH species due to construction activities and from placement of the cofferdam across the channel would be similar to the proposed action. Noise occurring from construction activities would occur for a similar period of time, therefore similar impacts from noise would occur with alternative #2.

*Indirect Impacts to EFH*

Indirect impacts to EFH and species with designated EFH in the project area would be similar to those experienced with implementation of the proposed action. Partial filling of the scour hole would result in less construction impacts and would still leave some deep water habitat in the IHNC, but would not have the same level of positive impacts of improved DO and salinity conditions.

*Cumulative Impacts to EFH*

Cumulative impacts to EFH under alternative #2 would be similar to those described under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to EFH*

Some direct impacts to EFH would be similar to those discussed under the proposed action; however, alternative #3 would impact a total of approximately 12 acres of open water (approximately 10 acres for permanent easements and 2 acres for temporary easements) as compared with 9 acres for the proposed action. Unlike the proposed action, no scour holes are known to be present near the alternative #3 alignment; therefore filling the scour hole and those associated positive and negative impacts would not be included for this alternative.

During construction, a temporary braced cofferdam would be installed in the channel around the approximate perimeter of the sector gate and vertical lift gates for a period of approximately 6 months to 12 months. Due to the location of alternative #3, this cofferdam would not block all flow between Lake Pontchartrain and the IHNC. Temporary impacts to EFH species due to construction of the cofferdam in a wider section of the channel (as compared to the proposed action) would result in fewer temporary impacts because some volume of water would be allowed to flow into Lake Pontchartrain between the shoreline and cofferdam, through the Turning Basin.

Water would not be trapped between the alternative #3 alignment and the railroad bridge, as it would be with the proposed action, because alternative #3 is 1,500 ft south of the Seabrook Bridge. However, gyres and eddies could possibly occur in the Turning Basin north and south of the floodwall and in the barge slip.

Noise occurring from construction activities would occur for a similar period of time therefore similar impacts from noise would occur with the proposed action and alternative #3.

Although alternative #3 spans twice the amount of water as the proposed action, the expanded footprint would not result in a larger area of open water and bottom habitat disturbance than the proposed action since the proposed action requires a large amount of ROW to be required to fill in the existing south scour hole.

*Indirect Impacts to EFH*

Indirect impacts to EFH and species with designated EFH would be similar to those described under the proposed action. Increases in disturbances would result from alternative #3 since it would require a longer construction period to build the gate structures and floodwalls across the Turning Basin. This would result in a longer disturbance to the water clarity, salinity, and DO. Additionally, under alternative #3, the scour hole would not require filling, thereby preserving deep water habitat for EFH species and decreasing mortality to EFH species that use this area as a refuge. However, according to model results, DO concentrations in the IHNC may remain low if this highly stratified deep habitat is not filled, possibly causing more stress of some species traversing the IHNC.

*Cumulative Impacts to EFH*

Cumulative impacts to EFH under alternative #3 would be similar to those described under the proposed action. Alternative #3 is located farther south from the Seabrook Bridge than the proposed action or alternative #3.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to EFH*

Overall, direct impacts to EFH would be similar to those discussed under the proposed action; however, alternative #4 would permanently impact approximately 10 acres of open water as compared to 9 acres for the proposed action. Unlike the proposed action and alternative #2, no scour holes are known to be present near the alternative #4 alignment; therefore filling the scour hole and associated positive and negative impacts would not occur.

*Indirect Impacts to EFH*

Indirect impacts to EFH and species with designated EFH in the project area would be similar to those described under alternative #3.

*Cumulative Impacts to EFH*

Cumulative impacts to EFH under alternative #4 would be similar to those described under the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to EFH*

Overall, direct impacts to EFH would be similar to those discussed under the other alternatives; however, alternative #5 would impact a total of approximately 18 acres of open water (approximately 10 acres for permanent easements and 8 acres for temporary easements) as compared to 9 acres for the proposed action. Instead of filling the south scour hole, the scour hole north of the Seabrook Bridge in Lake Pontchartrain (figure 7) would need to be partially filled.

Temporary impacts to EFH species due to construction activities and from placement of the cofferdam would be less as compared to the proposed action and alternatives #2 through #4. Noise occurring from construction activities would occur for a longer period of time; however, the noise would be less contained because construction would occur in the lake. Additionally, construction in the lake would most likely impact a larger number of *Rangia* clams due to their higher density in the lake and the increased overall siltation expected with the larger structure of this alternative. Alternative #5 may also impact a greater number of large fishes since the northern scour hole is deeper and larger than the scour hole to the south.

*Indirect Impacts to EFH*

Under alternative #5, indirect impacts to EFH and species with designated EFH would be greater with regard to siltation, but less with regard to velocity, DO, and salinity than the proposed action. During construction, partial filling of the northern scour hole would result in fewer construction impacts from burial and or suffocation of organisms than the proposed action, and would still leave some deep water habitat in the IHNC because only partial filling of the scour hole is required. The lake alignment would continue to allow flow between the IHNC and Lake Pontchartrain to be maintained throughout construction. Maintaining flow between the IHNC and Lake Pontchartrain would lessen the possibility of persistent anoxic conditions leading to fish kills, and would allow organisms to continue to be transported or migrate through the IHNC. Alleviating these impacts would have fewer negative effects on the behavior, growth rate, feeding, recruitment, and growth to maturity compared to the other alternatives. The increase in overall construction duration could impact EFH such as *Rangia* clams located near the project area, but once construction was complete populations would be able to recover. SAV is not expected to be negatively impacted by the location of this project during construction. Turbidity would be controlled to the maximum extent possible and the nearest SAV bed is 4 miles east of the project. The longer duration of construction noise may cause some behavioral changes to EFH species and their prey occupying the project area as compared to the other alternatives, but the types of impacts would be similar to the proposed action.

After alternative #5 is complete, DO and salinity concentrations would not be improved as much as the proposed action because only partial filling of the northern scour hole would occur.

*Cumulative Impacts to EFH*

Cumulative impacts to EFH under alternative #5 would be similar to those described under the proposed action with some slight differences due to the placement of the alignment in the lake, the partial filling of the north scour hole, and the phased construction which would not require blocking flow between the lake and the IHNC. Overall similar impacts would occur because the majority of changes such as salinity reductions, reduced tidal pulse, and increases in DO are due to the implementation of the Borgne Barrier, and the closure of MRGO at Bayou La Loutre. The Violet Diversion, if implemented, could also add to these impacts.

Slight differences to cumulative impacts would include an increase in direct impacts to EFH from the physical placement of alternative #5 in the lake which would result in a larger footprint as compared to the proposed action. This slight increase in the footprint would partially deplete the deep water habitat where large red drum and spotted seatrout are known to occur. A few other deep water holes occur in Lake Pontchartrain with the closest occurring in the IHNC; however this habitat is sparse. Partially depleting this habitat could create increased competition for space, slight decreases in growth rates, and increased predation by large fish capable of spawning. The number of fish impacted by the partial filling of the scour hole is not expected to cause changes in population for these species in Lake Pontchartrain.

Phased construction would reduce the cumulative impacts to species with designated EFH and their prey species by reducing the likelihood of fish kills that would occur with the proposed action (from the IHNC cofferdam). Fish kills would not be expected with alternative #5 because flow between the lake and the IHNC would remain continuous during construction. This would reduce the additive impact on the overall number of organisms killed by anoxic conditions even though construction would occur for a longer period of time. A reduction in the number of fish kills in the project vicinity would result in an increase in successful recruitment of larvae and juveniles into the lake thus more organisms would have a chance to grow to maturity.

### 3.2.6 Wildlife

Existing Conditions

Wildlife diversity and abundance within the project area are dependent on the quality and extent of suitable habitat available. Potential habitat areas that could be impacted by the proposed action include the open waters of Lake Pontchartrain and the man-made IHNC, small patches of scrub-shrub community, and open grassy uplands maintained along the existing HSDRRS. Wetlands, Aquatic Resources and Fisheries, and Upland Resources are described in sections 3.2.3, 3.2.4, and 3.2.8 of this IER. The majority of terrestrial habitat within the project area occurs between the banks of the IHNC and the existing HSDRRS that parallels the channel.

Terrestrial wildlife habitat in the Seabrook area consists principally of disturbed or early successional herbaceous communities with limited areas of shrubs and small trees. The IHNC shoreline is often flooded during major storm events, making it difficult for trees to take root and grow large enough to establish themselves into the landscape. Land use in and around Seabrook consists predominantly of active and abandoned industrial properties owned by the Port of New Orleans. Vegetative communities associated with the existing HSDRRS are composed of mainly turf grasses with herbs and scattered shrubs and small trees. Grassy areas along the existing levees and floodwalls are subject to routine mowing, which prevents the grasses from growing tall enough to provide cover, limits vegetative diversity, and reduces habitat value. In addition, a large portion of the project area is paved and provides no wildlife habitat. Lake Pontchartrain Properties recreational vehicle (RV) park is located at the southern end of the project corridor, on the west bank of the IHNC near Slip No. 5 (figure 13). This RV park includes paved parking surfaces, landscaped grassy areas, and a few palm trees. Thus, there is very little quality habitat for terrestrial wildlife within the project area.

As described in section 3.2.8, the upland habitat within the project area is of relatively low quality. However, there are several acres of open water and shoreline which provide habitat for aquatic and semi-aquatic wildlife, particularly wading birds, waterbirds, and waterfowl. The IHNC is a man-made navigational channel consisting of a main channel with several small slips branching out from both the east and west banks. The aquatic habitat of the IHNC has been previously disturbed by dredging and construction activities related to navigation of large vessels. Due to the industrial noise, traffic, and repeated disturbance of the area, it is unlikely that many aquatic wildlife species permanently inhabit the Seabrook area of the IHNC; however, it is expected that they occasionally use the channel as a route to pass between the GIWW and Lake Pontchartrain.

Wildlife that typically inhabit terrestrial or brackish aquatic habitats such as those in the project area include a limited assemblage of amphibians, reptiles, birds, and mammals. Species from each of these classes that may occur in the habitats of the project area can be identified based on the geographical ranges and habitat preferences of each species. An amphibian that may occur in the terrestrial habitats is the Gulf Coast toad (*Bufo valliceps*). Reptiles that may utilize habitats such as those of the project area include the common snapping turtle (*Chelydra serpentina*) and green anole (*Anolis carolinensis*) (Conant and Collins 1998; Felley 1992; Wigley and Lancia 1998).

Mammals that may occur in the habitats of the project area include the muskrat (*Ondatra zibethicus*), cotton mouse (*Peromyscus gossypinus*), and raccoon (*Procyon lotor*) (Whitaker 1998; Wigley and Lancia 1998). Marine mammals that potentially may enter the IHNC and swim through the project area include the bottlenose dolphin (*Tursiops truncatus*), the only cetacean likely to occur in the project area (NOAA 2008), and the West Indian manatee (*Trichechus manatus*) (Abadie et al. 2000), which is endangered and discussed in section 3.2.8.

The bottlenose dolphin has not been observed to utilize the IHNC as an important habitat or migration route, and it is not known to regularly inhabit Lake Pontchartrain (Barry et al. 2008). A large number of dolphins typically occur in the Mississippi Sound and Lake Borgne to the east of Lake Pontchartrain. These dolphins can enter Lake Pontchartrain through the two natural tidal passes at the east end of the lake, The Rigolets and Chef Menteur Pass, and groups of dolphins were observed in these passes and the eastern end of Lake Pontchartrain in 2008 (Barry et al. 2008). Dolphins also could potentially enter Lake Pontchartrain through the IHNC via the GIWW. A NOAA study (Barry et al. 2008) of a group of dolphins that remained in the eastern end of the lake in 2008 did not record observations of dolphins in the area of the IHNC in larger-scale surveys. NOAA reported that personnel of the Louisiana Department of Wildlife and Fisheries considered occurrences of bottlenose dolphins far from the eastern boundary of the lake to be uncommon (Barry et al. 2008). Thus, the bottlenose dolphin could occur in the project area, but such occurrences are expected to be rare.

Birds that may utilize the habitats of the project area include both non-migratory residents of the region and migratory species that are present only part of the year. Non-migratory species that may forage along the shoreline and in the open water of the area include the brown pelican (*Pelecanus occidentalis*), anhinga (*Anhinga anhinga*), Caspian tern (*Hydroprogne caspia*), royal tern (*Thalasseus maxima*), Forster's tern (*Sterna forsteri*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), black-crowned night heron (*Nycticorax nycticorax*), black skimmer (*Rynchops niger*), American coot (*Fulica americana*), and fish crow (*Corvus ossifragus*). Migrant birds that may occur in the area during winter include the double-crested cormorant (*Phalacrocorax auritus*), common loon (*Gavia immer*), mallard (*Anas platyrhynchos*), lesser scaup (*Aythya affinis*), laughing gull (*Larus atricilla*), ring-billed gull (*Larus delawarensis*), and herring gull (*Larus argentatus*) (Dunn and Alderfer 2006, Wigley and Lancia 1998, America's Wetland 2009). There also is a potential for the non-migratory bald eagle (*Haliaeetus leucocephalus*) to forage for fish in the project vicinity, though the level of human activity in the area makes this unlikely. The bald eagle was recently delisted as a federally threatened species (August 2007), but it continues to be protected under the Bald and Golden Eagle Protection Act as well as the Migratory Bird Treaty Act. Habitats suitable for use by the bald eagle are present in Orleans Parish, and occurrences of the bald eagle have been recorded in the parish. However, habitats in the area of the IER #11 Tier 2 Pontchartrain project do not satisfy nesting requirements for the bald eagle, such as large bald cypress or other tall trees, and the bald eagle would not be expected to nest in the project area or to forage there frequently.

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Wildlife*

Under the proposed action, construction of the new structures across the IHNC would not result in the loss of high quality habitat for terrestrial wildlife because the footprint of the new gate structure on the banks of the IHNC would remain within areas along the floodwall/levee that are covered mainly by grass and are periodically mowed or are partially paved industrial areas (figure 5). A permanent loss of approximately 14 acres of potential wildlife habitat (both open water and uplands) and a temporary construction easement of approximately 12 acres would occur under the proposed action. Although there could be effects on terrestrial birds, mammals, reptiles, and amphibians from construction and clearing, the project footprint in these areas would affect marginal, mainly grassy habitat that has become established on the ROW along the roads, floodwalls and levees which does not provide important habitat for wildlife. A portion of the temporary construction easement required by the proposed action would be a staging area on the west bank of the IHNC. The staging area is currently leased from the Port of New Orleans for equipment storage by Shavers-Whittle Inc. It is largely covered by gravel or concrete, with small areas of weedy growth near the water's edge (figure 6, table 8). This area does not represent a high quality habitat for wildlife due to its lack of vegetation, proximity to industrial activities, and periodic disturbance by heavy equipment. Wildlife living in the relatively small area of terrestrial habitat impacted by the staging area could find similar habitat on adjacent shorelines farther south or north in the IHNC or along the shores of Lake Pontchartrain.

The relatively small areas of wildlife habitat potentially affected by the project are adjacent to areas of similar habitat. The presence of construction-related activity, machinery, and noise would be expected to cause most wildlife, terrestrial and aquatic, to avoid the construction area and adjacent habitats during the construction period. The greatest potential for effects on wildlife associated with the proposed action would occur during construction, which is anticipated to last approximately 36 months.

Aquatic wildlife using open-water habitats in the project area are mobile and could move to similar habitats in the area at the start of construction activities. Underwater noise from pile driving can be harmful to aquatic animals in many ways, producing effects that range from avoidance and other behavioral changes to injury and death. In particular, cetaceans such as the bottlenose dolphin are especially sensitive. Pile-driving activities in the IHNC could expose aquatic wildlife to high-intensity sound impulses in the immediate project area. However, the wildlife potentially present would be mainly birds, which could avoid the area during construction activities. Pile-driving activities in the IHNC would have the greatest potential to cause adverse effects on individual aquatic organisms present in the vicinity. Underwater noise from pile driving can be harmful in many ways to marine mammals, turtles, and fish. All of these animals are highly mobile and could move away from the sound. Therefore, the likelihood that they would be present when pile driving is occurring and would remain close enough to the sound source to be injured is very small. During construction, the cofferdam would span the entire canal, essentially damming the IHNC at Seabrook for approximately 6 months to 12 months and preventing bottlenose dolphins and other aquatic wildlife from passing between Lake Pontchartrain and the IHNC. If a dolphin were present within the IHNC and became blocked from reaching the lake by the cofferdam, it could exit the area and reach the lake via the GIWW and natural passages to the east. Due to the noise and traffic at the construction site, it is likely that this very mobile species would avoid the vicinity. In addition, the potential for effects on dolphins would be further reduced by the use of standard measures for the protection of manatees and sea turtles, which would be implemented to protect these threatened and endangered species during construction as described below for the proposed action (section 3.2.7). The simultaneous application of these measures to bottlenose dolphins would be similarly protective of this species.

The temporary cofferdam that would be installed during construction of the proposed action would not allow the movement of aquatic wildlife (in particular, marine mammals such as bottlenose dolphins and manatees) between the north and south sides of the alignment. However, these mammals have not been observed to utilize the IHNC as an important habitat or migration route, and alternative passages between Lake Borgne and Lake Pontchartrain would remain available to the east (the Rigolets and Chef Menteur Pass). After construction and removal of the cofferdam, the completed control structure is expected to provide adequate passage for aquatic wildlife to cross the barrier through the three gates. The infrequent operation of the gates on the IHNC would be relatively slow and would have little or no potential to injure wildlife during their closure. Consequently, direct impacts to marine mammals or other wildlife from the construction of the proposed action, temporary closure of the IHNC by a cofferdam, or subsequent operation of the structure would be minimal.

*Indirect Impacts to Wildlife*

Potential indirect impacts on wildlife from the proposed action mainly would involve the displacement of wildlife populations from the area within the project footprint. Movement of the limited numbers of wildlife that currently utilize this area into surrounding, unimpacted habitats would not be expected to result in exceedances of the carrying capacity of the extensive, adjacent, similar habitats.

Dolphins and birds could be affected if changes in hydrology and water quality affect their prey (e.g., fish, shrimp, and mollusks). However, temporary and permanent changes to prey species, associated with changes in velocity, salinity, and water quality are anticipated based on the results of hydrological modeling, as previously discussed in sections on Aquatic Resources and Fisheries (section 3.2.4), and EFH (section 3.2.5). During construction, there could be effects from the closure of the IHNC and associated changes in water circulation and recruitment patterns on the populations of fish and invertebrates utilized as prey by wildlife in the immediate area. Also, wildlife may avoid the area during construction because of the associated noise. However, such impacts would be temporary and minimal because most wildlife potentially affected, such as waterbirds, are highly mobile and able to forage elsewhere,

*Cumulative Impacts to Wildlife*

Potential cumulative impacts on wildlife from the proposed action mainly would involve the combined effects on wildlife from habitat loss and displacement of wildlife populations from the multiple LPV projects in the New Orleans area. The habitats that would be affected in the vicinity of the IHNC are similar to extensive areas of waterway and developed uplands in the New Orleans region. The potentially impacted habitat areas are very small in the context of similar habitats in the region. Movement of the limited numbers of wildlife that currently inhabit these areas into surrounding, unimpacted habitats would not be expected to result in exceedances of the carrying capacity of the extensive, adjacent habitats. In addition, wildlife habitat impacts from this and other LPV flood control projects would be mitigated through wetland creation and enhancement activities designed to minimize cumulative habitat losses in the project area and the region. As a result, the proposed action would contribute negligibly to the minimal cumulative impacts on wildlife occurring in the region.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct, Indirect and Cumulative Impacts to Wildlife*

Under alternative #2, the direct impacts to wildlife habitat would be similar to the proposed action. Compared to the proposed action, alternative #2 would result in a smaller permanent loss of potential wildlife habitat (approximately 12 acres of open water and uplands), but a slightly larger area would be required for temporary construction easements (approximately 15 acres). The same staging area would be used, and the gate control building would be in the same place as under the proposed action. The indirect and cumulative impacts to wildlife would be essentially the same as were described for the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Wildlife*

The principle difference between alternative #3 and the proposed action is that it would result in a larger loss of open-water and terrestrial habitat because this alignment would cross both the Turning Basin and the western shore of the IHNC. Approximately 18 acres of potential wildlife habitat would be permanently lost under alternative #3. In addition, a temporary easement of roughly 12 acres would be required. Approximately 7 acres of permanent ROW would be necessary for raising the I-walls to T-walls north of the control structure. Although this represents a permanent loss of habitat, it is currently occupied by France Road and the existing floodwall ROW, which do not provide quality wildlife habitat. Due to the industrial uses of the shores and canal, the effect of the larger amounts of lost habitat on wildlife would be minimal. Therefore, although they would be larger, the direct impacts to wildlife from alternative #3 would be similar as those described for the proposed action.

*Indirect and Cumulative Impacts to Wildlife*

Indirect and cumulative impacts to wildlife under alternative #3 would be essentially the same as those described for the proposed action.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Wildlife*

The direct impacts to wildlife due to alternative #4 would be essentially the same as those described for alternative #3 and the proposed action. The principle difference amongst these alternatives is the amount of aquatic and terrestrial habitat permanently lost. A permanent loss of approximately 15 acres of potential wildlife habitat (open water and uplands) and a temporary loss of approximately 12 acres for construction easements would be required under alternative #4. An additional 9 acres of permanent ROW would be necessary for the raising of the I-walls to T-walls north of the control structure. Although this represents a permanent loss of habitat, it is currently occupied by France Road and the existing floodwall ROW, which do not provide quality wildlife habitat. Under this alternative, the terrestrial impacts would be similar to alternative #3, while the aquatic impacts would be similar to the proposed action.

*Indirect and Cumulative Impacts to Wildlife*

Indirect and cumulative impacts to wildlife under alternative #4 would be essentially the same as those described for the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Wildlife*

The direct impacts to wildlife due to alternative #5 would be similar to those described for alternative #3. A larger amount of aquatic habitat would be lost than under the proposed action, due to the placement of the sector gates to the north of the Seabrook Bridge. Due to the increased amount of construction in the lake itself, there could be an increased potential for impacts to aquatic wildlife, such as the bottlenose dolphin and manatee that may be more likely to occur in the lake than the canal. Smaller amounts of terrestrial habitat would be lost than under alternative #3, however, as the tie-ins would be placed in areas that are already paved which represent poor wildlife habitat. Potential wildlife habitat impacts under alternative #5 include approximately 12 acres lost to permanent structures and associated ROW, and a temporary loss of approximately 21 acres during construction. For a description of the impacts to Aquatic Resources and Fisheries and EFH under this alternative, see sections 3.2.4 and 3.2.5.

*Indirect and Cumulative Impacts to Wildlife*

Indirect and cumulative impacts to wildlife under alternative #5 would be essentially the same as those described for the proposed action.

### 3.2.7 Threatened and Endangered Species

<u>Existing Conditions</u>

In accordance with the provisions of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 USC 1531 et seq.), the CEMVN requested information on protected, proposed, and candidate species and critical habitat that may occur in the vicinity of IER #11 and the proposed Tier 2 Pontchartrain project from the USFWS office in Lafayette, Louisiana. In response and in accordance with the provisions of the ESA and the Migratory Bird Treaty Act of 1918 (40 Stat. 755, as amended; 16 USC 703 et seq.), USFWS responded in a letter dated 2 February 2009 (appendix E). The USFWS determined that, of the federally listed species that occur in the region and for which the USFWS has responsibility, most were unlikely to be adversely affected by the proposed action. The USFWS identified only one species that potentially could be impacted by the IER #11 Tier 2 Pontchartrain project: the endangered West Indian manatee (*Trichechus manatus*) (USFWS 2009).

In addition, four federally listed species that are the responsibility of the NMFS have a potential to occur in the project area: the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*), the threatened loggerhead sea turtle (*Caretta caretta*), and the threatened green sea turtle (*Chelonia mydas*). As part of its consultation regarding these species, NMFS provided to CEMVN a letter (NMFS 2009) in which it concurred with CEMVN's determination that this project individually, as well as in conjunction with other IER projects on the south shore of Lake Pontchartrain, is not likely to adversely affect listed sea turtle species, Gulf sturgeon, or designated Gulf sturgeon critical habitat. The potentially affected threatened and endangered species are discussed below.

*West Indian Manatee*

The West Indian manatee is federally and state-listed as endangered and also is protected under the Marine Mammal Protection Act of 1972, under which it is considered depleted (USFWS 2001). It occurs in both freshwater and saltwater habitats within tropical and subtropical regions and includes two subspecies, the Florida manatee (*T. manatus latirostris*) and the Antillean manatee (*T. manatus manatus*). The primary human-related threats to the manatee include watercraft-related strikes (impacts and/or propeller strikes), crushing and/or entrapment in water control structures (flood gates, navigation locks), and entanglement in fishing gear (discarded fishing line, crab traps) (USFWS 2007a).

The Florida manatee can occur throughout the coastal regions of the southeastern U. S. and may disperse greater distances during warmer months; it has been sighted as far north as Massachusetts and as far west as Texas. However, the manatee is a subtropical species with little tolerance for cold, and it returns to and remains in the vicinity of warm-water sites in peninsular Florida during the winter (USFWS 2007a; USFWS 2007b). Thus, the manatee is not a year-round resident in Louisiana, but it may migrate there during warmer months. Manatees prefer access to natural springs or man-made warm water and waters with dense beds of submerged aquatic or floating vegetation. Manatees prefer to forage in shallow grass beds that are adjacent to deeper channels. They seek out quiet areas in canals, creeks, lagoons, or rivers, using deeper channels as migratory routes (USFWS 1999).

There were 110 reported sightings of manatees in Louisiana between 1975 and 2005 (LaDWF 2005a). Sightings in Louisiana have been uncommon and sporadic, and have included occurrences in Lake Pontchartrain and in the vicinity of the MRGO and Bayous Bienvenue and Dupre (Abadie et al. 2000). Although manatees can occur in the IHNC, preferred food sources (submerged or floating aquatic vegetation) are absent from the project area. Given the extensive areas of relatively undisturbed wetlands in the region and the frequent passage of boats and large vessels through the IHNC, it is unlikely that manatees would utilize this area as habitat or frequently occur in the project area.

*Gulf Sturgeon*

The Gulf sturgeon is federally listed as threatened throughout its range and is state-listed as threatened in Louisiana. It supported an important commercial fishing industry during the late 19th and early 20th centuries. A minor commercial fishery was reported to exist for Gulf sturgeon in Lake Pontchartrain and its tributaries during the late 1960s (USFWS and NOAA 2003). Throughout most of the 20th century, Gulf sturgeon suffered population declines due to over fishing, habitat loss, water quality deterioration, and barriers to historic migration routes and spawning areas (dams). In 1991, the Gulf sturgeon was listed as a threatened species under the Endangered Species Act (16 USC 1531 et seq.). The present range of the species extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida (USFWS and NOAA 2003).

The Gulf sturgeon is an anadromous fish that migrates from saltwater into large coastal rivers to spawn and spend the warm months. Subadults and adults typically spend the 3 to 4 coolest months in estuaries or Gulf of Mexico waters before migrating into rivers as temperatures increase. This migration typically occurs from mid-March through June. Most adults spend 8 to 9 months each year in rivers before returning to the estuary or the Gulf of Mexico by mid-November to early December. Thus, the Gulf sturgeon spends the majority of its life in freshwater (USFWS and GSMFC 1995), yet subadult and adult Gulf sturgeon do not feed significantly in freshwater. Instead, they rely almost entirely on estuarine and marine habitats for feeding. Young-of-the-year and juveniles feed mostly in the riverine environment (USFWS and NOAA 2003). The diet of the Gulf sturgeon consists predominantly of invertebrates captured by foraging in sediment. The types and sizes of invertebrates consumed vary according to life history stage and annual migration. Adults in estuaries and coastal waters consume mainly amphipods, isopods, gastropods, brachiopods, polychaete worms, lancelets, and shrimp. Fish are seldom eaten, and detritus is consumed incidentally while foraging (USACE 2006c).

Critical habitat identifies specific areas that are essential to the conservation of a listed species. Various activities in or adjacent to each of the critical habitat units may affect certain physical and biological features necessary to the preservation of the species and, therefore, may require special management considerations or protection. Fourteen geographic areas (units) among the Gulf of Mexico rivers and tributaries have been designated as critical habitat for the Gulf sturgeon. Offshore critical habitat extends from Lake Borgne and the Rigolets along the Gulf Coast to the Suwannee Sound, Florida. Of the 14 units designated by USFWS and the NMFS among Gulf of Mexico rivers and tributaries, Units 1 to 7 are river systems and Units 8 to 14 are estuarine and marine systems (USFWS and NOAA 2003). The project area includes a portion of Unit 8, which encompasses Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, the Rigolets, Lake Catherine, Lake Borgne, and the Mississippi Sound. Critical habitat follows the shorelines of each water body. Estuaries and bays located adjacent to riverine units were designated as critical habitat to protect unobstructed passages for sturgeon between feeding and spawning areas (USACE 2006c). Sturgeon migrations to rivers that enter Lake Pontchartrain follow routes through Lake Borgne and the Rigolets. Studies conducted by the LaDWF have shown the presence of Gulf sturgeon in Lake Pontchartrain, the Rigolets, and Lake Borgne during the winter and during periods of migration to and from marine environments. Thus, critical habitat was designated for the Gulf sturgeon in each of these areas (USACE 2006c).

The proposed action and alternatives #2, #3, and #4 alignments in the IER #11 Tier 2 Pontchartrain project area would be within the IHNC south of the designated critical habitat for the Gulf sturgeon in Lake Pontchartrain. The alternative #5 alignment would be immediately north of the IHNC within the critical habitat area of the lake. Gulf sturgeon potentially could pass through or near the IHNC principally during the 3 to 4 coolest, winter months and periods of migration between Lake Pontchartrain and Lake Borgne. The Gulf sturgeon would not be expected to occur in the project area during the 8 to 9 warmer months of the year. The area along the south shore of Lake Pontchartrain is relatively unlikely to be used as a migratory route by Gulf sturgeon because the rivers to which they migrate are on the north shore of the lake. Although, the IHNC could provide a migratory route between Lakes Borgne and Pontchartrain for individual sturgeon, sightings or captures of Gulf sturgeon have not been reported from the IHNC. Sturgeon migrations to rivers that drain to Lake Pontchartrain have been shown by tracking studies to predominantly follow a route through the Rigolets (USACE 2006c).

Although Gulf sturgeon would not be expected to utilize the IHNC as an important migratory route to the rivers on the north shore, they potentially could forage in the shallow, inshore lake habitat near the mouth of the IHNC in winter. Gulf sturgeon would not be expected to utilize the project area in or near the IHNC as a significant habitat component because the sediments in this area do not have the characteristics that Gulf sturgeon prefer for foraging. Sediments within the IHNC near the proposed action alignment consist of silt, clay, and sand (USACE 2008b). Observations of Gulf sturgeon in marine and estuarine habitats have found them to be associated with mainly sand as well as sand/mud bottoms (USFWS and GSMFC 1995; Harris 2003). The IHNC is an artificial waterway with heavy boat traffic, a highly developed shoreline, and very limited habitat value for the Gulf sturgeon. The area of Lake Pontchartrain near the mouth of the IHNC similarly is a heavily trafficked and developed area. Thus, any presence of Gulf sturgeon in the project area likely would be transitory and occasional.

*Kemp's Ridley, Loggerhead, and Green Sea Turtles*

Sea turtles are air-breathing reptiles with large flippers and streamlined bodies. They inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in waters of the U.S., and all are listed as threatened and endangered. The three species identified by NMFS as potentially occurring in the vicinity of the project area are similar in appearance, though they differ in maximum size and coloration.

The Kemp's ridley is the smallest of these sea turtles; adults average about 100 pounds (lbs) with a carapace length of 24 inches to 28 inches and a shell color that varies from gray in young individuals to olive green in adults. It has a carnivorous diet that consists mainly of crabs and may also include fish, jellyfish, and mollusks. The loggerhead is the next largest of these three species; adults average about 250 lbs with a carapace length of 36 inches and a reddish brown shell color. It has an omnivorous diet that includes fish, jellyfish, mollusks, crustaceans, and aquatic plants. The green sea turtle is the largest of the three; adults average 300 lbs to 350 lbs with a length of more than 3 ft and brown coloration (its name comes from its greenish colored fat). It has a herbivorous diet of aquatic plants, mainly seagrasses and algae, which is unique among sea turtles.

All three species are known to forage as juveniles and adults in nearshore waters, including estuaries, in Louisiana and may be more likely to occur there in months when the waters are warmer. The Kemp's ridley and loggerhead turtles potentially could find suitable foraging habitat for invertebrates and fish in the open waters of Lake Pontchartrain. The green turtle is less likely to occur there due to the scarcity of the seagrasses on which they feed. All three species nest on sandy beaches, which are not present in the project area, and the Kemp's ridley does not nest in Louisiana. The life stages that may occur in the Lake Pontchartrain area are likely to be older juveniles to adults (NMFS 2008). The IHNC is an artificial waterway with heavy boat traffic, a highly developed shoreline, and negligible habitat value to these sea turtle species. Thus, any presence of sea turtles in the project area would be transitory and occasional.

<u>Discussion of Impacts</u>

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

As discussed previously, the manatee was the only federally listed endangered or threatened species identified by USFWS as being under their jurisdiction and having a potential to be impacted by the IER #11 Tier 2 Pontchartrain project. The USFWS concurred with the CEMVN, in a letter dated 2 February 2009 (appendix F), that the proposed action would not have adverse impacts on the manatee. In addition, there is the possibility of transitory, occasional occurrences in the project vicinity of four species under NMFS jurisdiction: the Gulf sturgeon and Kemp's ridley, loggerhead, and green sea turtles. As part of its informal consultation with NMFS regarding potential effects of the IER #11 Tier 2 Pontchartrain project on these four species, the CEMVN submitted to NMFS a request for concurrence with its conclusions that these species are not likely to be adversely affected by the proposed action and NMFS concurred in a letter dated 31 August 2009 (appendix E).

*Direct Impacts to Threatened and Endangered Species*

Construction of the proposed action would result in the loss of a limited area of marginal aquatic habitat for the five threatened and endangered species potentially affected. The aquatic footprint of the entire alignment, including the gates and the floodwalls, would cover an area of approximately 7 acres of open water habitat in the channel, and approximately 2.5 additional acres in Slip No. 6 (figure 6) may be temporarily disturbed by use as a staging area during construction (table 8). The manatee and Gulf sturgeon have the potential to occur in the area during only part of the year, and such occurrences, particularly for the manatee, are expected to be infrequent. Sea turtle occurrences in the area also appear to be infrequent and are less predictable but least likely during the colder months.

The greatest potential for direct effects on these five listed species from the proposed action would occur during the construction period (estimated to be approximately 36 months). The presence of construction-related activity, machinery, and noise likely would cause the manatee, sturgeon, and sea turtles to avoid the project area during construction. Pile-driving activities in the IHNC would have the greatest potential to cause adverse effects on individual aquatic organisms present in the vicinity. Underwater noise from pile driving can be harmful in many ways to marine mammals, turtles, and fish. All of these species are highly mobile and could move away from the sound. Therefore, the likelihood that they would be present when pile driving is occurring and would remain close enough to the sound source to be injured is very small.

During construction, the cofferdam would span the entire canal, essentially damming the IHNC at Seabrook for approximately 6 months to 12 months and preventing these species from passing between Lake Pontchartrain and the IHNC. If a manatee, Gulf sturgeon, or sea turtle were present within the IHNC and became blocked from reaching the lake by the cofferdam, it could exit the area and reach the lake via the GIWW and the natural passages to the east. Due to the noise and traffic at the construction site, it is likely that these mobile species would avoid the vicinity. The potential for adverse impacts on threatened and endangered species due to adverse effects on water quality of inshore areas of Lake Pontchartrain or the IHNC during the construction period would be minimized through adherence to regulations governing stormwater runoff at construction sites and the use of BMPs and SWPPPs, as discussed in section 3.2.2. Consequently, impacts on water quality in Lake Pontchartrain are expected to be temporary and minimal, and Gulf sturgeon critical habitat within the lake would not be adversely affected by construction of the proposed action.

In order to minimize the potential for construction activities under the proposed action to cause impacts to the manatee, standard manatee protection measures would be followed. These procedures have been recommended by USFWS (USFWS 2009) and adopted by USACE (2005) for use in situations where in-water construction activities potentially could occur where manatees may be present. These procedures include the following:

> All contract personnel associated with the project would be informed of the potential for manatees to be present and of the need to avoid collisions with manatees, which are protected under the Endangered Species Act and the Marine Mammal Protection Act of 1972. All construction personnel would be responsible for observing water-related activities for the presence of manatees. Temporary signs would be posted before and during all construction activities to remind personnel to be alert for the possible presence of manatees during active construction operations and within vessel movement zones in the work area; at least one sign would be placed where it would be visible to the vessel operator. Siltation barriers would be made of material in which manatees could not become entangled and would be properly secured and monitored if used. If a manatee were to be sighted within 100 yards of the active work zone, special operating conditions would be implemented, including: no operation of moving equipment within 50 ft of a manatee; all vessels would operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, would be re-secured and monitored. Activities would not resume until the manatee has left the 100-yard buffer zone around the work area on its own accord. Then, special operating conditions would no longer be necessary, and careful observation would resume. Any sighting of a manatee would be immediately

reported to the USFWS Lafayette, Louisiana field office and the Natural Heritage Program of the LaDWF.

In order to minimize the potential for construction activities under the proposed action to cause impacts to sea turtles, construction conditions recommended by NMFS would be followed. These conditions include the following:

> All personnel associated with the project would be instructed of the potential presence of sea turtles and the need to avoid collisions with sea turtles. All construction personnel would be responsible for observing water-related activities for the presence of these species. All construction personnel would be advised that there are civil and criminal penalties for harming, harassing, or killing sea turtles, which are protected under the Endangered Species Act of 1973. Siltation barriers would be made of materials in which sea turtles cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers would not block sea turtle entry to or exit from designated critical habitat without prior agreement from the NMFS' Protected Resources Division, St. Petersburg, Florida. All vessels associated with the construction project would operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels would preferentially follow deep-water routes (e.g., marked channels) whenever possible. If a sea turtle is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions would be implemented to ensure its protection. These precautions would include the cessation of operation of any moving equipment closer than 50 ft of a sea turtle. Operation of any mechanical construction equipment would cease immediately if a sea turtle is seen within a 50 ft radius of the equipment. Activities would not resume until the protected species has departed the project area of its own volition. Any collision with and/or injury to a sea turtle would be reported immediately to the NMFS' Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

The eastern portion of Lake Pontchartrain is designated as critical habitat for the Gulf sturgeon. The project area is approximately 600 ft south of Lake Pontchartrain and the critical habitat, which follows the shoreline. The potential for this critical habitat to be impacted by adverse effects on water quality during the construction period would be minimized through the use of BMPs and adherence to regulations governing stormwater runoff at construction sites. To avoid the movement of sediments north into Lake Pontchartrain and Gulf sturgeon critical habitat, the contractor would fill in the south scour hole and construct the cofferdam only during slack tide in the IHNC, when water is moving from Lake Pontchartrain into the IHNC. In addition, if possible with the flows experienced in the project area, the contractor would install and maintain a Type III silt barrier/curtain at a distance not to exceed 500 ft upstream and downstream from the point of discharge of the fill. The contractor would be required to take three readings per work day with a turbidity meter at locations not to exceed 500 ft upstream and downstream from the point of discharge to ensure that at no time is a difference in turbidity of 50 NTU exceeded. With the use of such procedures, sedimentation impacts from the proposed action on Gulf sturgeon critical habitat would be unlikely. Thus, the construction of the proposed action would not be expected to adversely impact endangered or threatened species or Gulf sturgeon critical habitat.

Following removal of the cofferdam, the manatee, Gulf sturgeon, and sea turtles would be able to swim through the IHNC sector gate with little hindrance when the gates are open. The gates would remain in the open position except during storm periods or maintenance activities. The rest of the time, flow would be maintained through the gates, allowing passage for these species. Particularly for the manatee, however, these gates could pose a limited risk of injury during the long-term period of operation. Entrapment in water-control structures and navigational locks is the second largest human-related cause of manatee deaths (USFWS 2001). The gate would be closed only infrequently as needed to prevent flooding associated with major storms, high flow events, and for maintenance. The low likelihood of a manatee being present in the project area because it does not provide suitable/preferred manatee habitat, combined with the low likelihood of a gate being actively closed when a manatee is present, would minimize the potential for a manatee to be trapped or injured by operation of the gate. In addition, the relatively slow movement of the gate would likely give a manatee time to move out of the gate opening. The faster-swimming sturgeon and sea turtles would unlikely be at risk from injury due to the closing of the gates.

Collisions with boats and barges are a primary human-related threat to manatees and sea turtles and pose a risk to these species in the IHNC under existing conditions. Under the proposed action, the presence of gates on the IHNC at this location would constrict the channel through which both vessels and wildlife pass, increasing the potential for injuries to manatees and sea turtles should they swim through the sector gate at the same time a vessel is passing through. Given the rarity of manatees and sea turtles in the project area, the likelihood of this occurrence is very low. In addition, the slow speeds of vessels required as they pass through the gate would increase the response time available to these animals to avoid a collision and, if an impact occurs, the degree of injury generally would be lower if the boat or barge is operating at slower speeds (USFWS 2007a). The vertical lift gates on either side of the sector gate would provide two passages for these species that are not open to navigational traffic, and although it is not known if the animals would actively choose this option, the presence of the lift gates would further reduce the odds of boat-animal collisions.

In summary, there is the possibility of occasional, transitory occurrences of five federally listed species (the manatee, Gulf sturgeon, and Kemp's ridley, loggerhead, and green sea turtles) in the project area. The manatee could transit the area sporadically during the summer, Gulf sturgeon may be present in Lake Pontchartrain during several months mainly in winter, and sea turtles may enter the area rarely during warmer months. The potential for individuals of any of these species to be impacted by the proposed action appears to be minimal. Procedures for preventing disturbance or injury of these species would be employed during construction, further minimizing the potential for individuals to be affected by the proposed action. Therefore, the manatee, Gulf sturgeon, and Kemp's ridley, loggerhead, and green sea turtles, as well as Gulf sturgeon critical habitat, would be unlikely to be adversely affected by direct impacts from the proposed action.

*Indirect Impacts to Threatened and Endangered Species*

Indirect impacts on endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Given that future operation of the new structure at the proposed alignment would be the same as described previously, indirect impacts on endangered or threatened species from the proposed action would be essentially the same as direct impacts. As discussed in section 3.2.4, changes in hydrology may affect aquatic communities in the project area, including effects on the passive transport of eggs and larvae of fish and invertebrates between Lake Pontchartrain and the IHNC. However, any such changes would not adversely affect these threatened and endangered species because they are not known or expected to forage in the site vicinity and are not dependent for food on the organisms that may be affected in the project area. Thus, indirect impacts would be unlikely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

*Cumulative Impacts to Threatened and Endangered Species*

Cumulative impacts on endangered and threatened species from the proposed action could occur mainly as a result of the combined effects of this project and the other LPV flood control projects in the New Orleans area on habitat available to the manatee, Gulf sturgeon, and Kemp's ridley, loggerhead, and green sea turtles. The habitats that would be directly affected in the vicinity of the project area on the IHNC are not high-quality, unique, or critical habitats for these species. The potentially impacted habitat areas within the IHNC are extremely small in the context of similar habitats in the region. If the area impacted by the construction of the proposed action were added to the areas of similar habitats potentially impacted by other LPV projects, the loss of this type of aquatic habitat would be negligible compared to the available habitat remaining. In addition, closure of the MRGO at Bayou La Loutre would cut off a direct connection with the Gulf of Mexico that likely has facilitated the movement of species, particularly sea turtles, northward toward the IHNC and the project area. Consequently, this closure may further reduce the numbers of individuals of threatened or endangered species that migrate through the project area, in turn reducing the potential for direct impacts. Migration by Gulf sturgeon between marine environments and the rivers that drain into Lake Pontchartrain from the north potentially may be impeded by the combination of structures, especially the MRGO closure at La Loutre. However, due to the post-construction operation plans for the various gates (open unless threatened by a storm or for periodic maintenance), it is expected that the proposed action would have a minimal additional cumulative impact on Gulf sturgeon migration. In addition, other passages, principally Chef Menteur Pass and the Rigolets, would not be altered, allowing continued migration between the Gulf of Mexico and Lake Pontchartrain via these natural routes. Thus, cumulative impacts on endangered or threatened species from other actions in conjunction with the proposed action would be unlikely to adversely affect the manatee, Gulf sturgeon, or sea turtles.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to Threatened and Endangered Species*

The principle difference between alternative #2 and the proposed action is that it would result in a smaller, permanent loss of open-water habitat (approximately 4 acres versus 7 acres) (figure 11, table 8). Assuming the procedures discussed for the proposed action would be employed to prevent injury to manatees and sea turtles and sedimentation impacts on Gulf sturgeon critical habitat during in-water construction activities, direct impacts to threatened and endangered species from alternative #2 would be essentially the same as those described for the proposed action. Alternative #2 would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

*Indirect and Cumulative Impacts to Threatened and Endangered Species*

Indirect impacts on endangered or threatened species from alternative #2 would be essentially the same as described previously for the proposed action. Thus, indirect and cumulative impacts from alternative #2 would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Threatened and Endangered Species*

Principle differences between alternative #3 and the proposed action are that alternative #3 would have a longer construction period and would result in a slightly larger permanent loss of open-water habitat (approximately 10 acres versus 7 acres) because this alignment would extend across the Turning Basin in the IHNC (figure 12, table 8). The longer duration of construction and larger footprint of this alternative potentially could increase the risk of a threatened or endangered species being directly impacted by alternative #3, but any such increase in risk likely would be minimal. Assuming the procedures discussed for the proposed action would be employed to prevent injury to manatees and sea turtles and sedimentation impacts on Gulf sturgeon critical habitat during in-water construction activities, alternative #3 would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles. In addition, the alternative #3 alignment would not require that that IHNC close during construction, therefore, aquatic species would be able to pass from the IHNC into Lake Pontchartrain for the entire construction duration (approximately 36 months). This would be less disruptive to potential migration and feeding patterns than the proposed action. It is expected, however, that construction noise would deter threatened and endangered species from frequenting the general vicinity, minimizing the benefit of this alternative.

*Indirect and Cumulative Impacts to Threatened and Endangered Species*

Indirect impacts on endangered or threatened species from alternative #3 would be essentially the same as described previously for the proposed action. Thus, indirect and cumulative impacts from this alternative would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Threatened and Endangered Species*

The principle difference between alternative #4 and the proposed action is its placement in the IHNC. This alignment would result in a permanent loss of approximately 7 acres of open water habitat, similar to the proposed action (figure 13, table 8). The direct impacts to threatened and endangered species from alternative #4 would be essentially the same as those described for the proposed action. Assuming the procedures discussed for the proposed action would be employed to prevent injury to manatees and sea turtles and sedimentation impacts on Gulf sturgeon critical habitat during in-water construction activities, alternative #4 would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

*Indirect and Cumulative Impacts to Threatened and Endangered Species*

Indirect impacts on endangered or threatened species from alternative #4 would be essentially the same as described previously for the proposed action. Thus, indirect and cumulative impacts from alternative #4 would not be likely to adversely affect the manatee, Gulf sturgeon, or Kemp's ridley, loggerhead, or green sea turtles.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Threatened and Endangered Species*

Under alternative #5, there would be a permanent loss of approximately 10 acres of aquatic habitat and a temporary loss of 8 acres during construction (figure 14, table 8). For the manatee and sea turtles, the direct impacts associated with alternative #5 would be essentially the same as for the proposed action. However, for the Gulf sturgeon, alternative #5 would directly impact critical habitat. Lake Pontchartrain east of the Causeway, including the embayment at the mouth of the IHNC, is designated as critical habitat for the Gulf sturgeon. Alternative #5 would permanently replace approximately 10 acres of aquatic habitat within the designated critical habitat for the Gulf sturgeon in Lake Pontchartrain. It also could temporarily impact approximately 2 acres of critical habitat within the construction easement.

As discussed for existing conditions, the area along the south shore of Lake Pontchartrain is relatively unlikely to be used as a migratory route by Gulf sturgeon because the rivers to which they migrate are on the north shore of the lake. Gulf sturgeon potentially could forage in the shallow, inshore lake habitat near the mouth of the IHNC mainly during the three to four coolest, winter months and during periods of migration between marine environments (Lake Borgne and the Mississippi Sound) and the spawning rivers that drain into Lake Pontchartrain. Sediments in the nearshore area near the IHNC that would be affected by alignment #5 are predominantly muddy sand and contain less than 50 percent sand (Ray 2007). Observations of Gulf sturgeon in marine and estuarine habitats have found them to be associated with mainly sand as well as sand/mud bottoms (USFWS and GSMFC 1995, Harris 2003). Thus, the substrate within alignment #5 may contain a less than optimal sand component, but this habitat does support an invertebrate community on which sturgeon could feed (Ray 2007). Accordingly, this area of the critical habitat may be utilized as an occasional foraging area by Gulf sturgeon, mainly during winter and migration periods.

Construction activities could result in localized and temporary increases in turbidity in the vicinity of the project area. These effects, however, would be reduced by the use of silt curtains and by the movement of the tides. The manatee, Gulf sturgeon, and sea turtles are mobile and would be able to relocate during construction since the project area encompasses only a relatively very small area near the shoreline of the over 403,000-acre lake. There would be no substantial changes in the chemical characteristics of the waters of Lake Pontchartrain that would affect these listed species as a result of alternative #5.

NMFS developed a biological opinion (BO) to complete its formal consultation regarding the proposed action at IER #5, which is located on the south shore of Lake Pontchartrain to the west of the IHNC and would destroy critical habitat for the Gulf sturgeon through the construction of two breakwaters. The BO evaluated the primary constituent elements (i.e., the physical and biological features that are essential to the conservation of the species) for the Gulf sturgeon in Lake Pontchartrain that potentially would be affected. The BO concluded that the IER #5 project would permanently impact approximately 3.3 acres of critical habitat, but would not reduce the ability of the remaining, extensive, critical habitat to support Gulf sturgeon conservation. Alternative #5 at IER #11 Tier 2 Pontchartrain likely would permanently impact approximately 10 acres of critical habitat, so it also would require formal consultation and issuance of a BO by NMFS to determine its effects.

*Indirect and Cumulative Impacts to Threatened and Endangered Species*

Indirect and cumulative impacts on endangered or threatened species from alternative #5 would be essentially the same as described previously for the proposed action. However, the Gulf sturgeon would be more affected by alternative #5 due to the long-term loss of approximately 10 acres of critical Gulf Sturgeon habitat. The relatively small area of habitat lost does not appear to be habitat that is unique or highly utilized by sturgeon. Thus, indirect and cumulative impacts from this alternative would not be likely to adversely affect the Gulf sturgeon or the manatee or Kemp's ridley, loggerhead, or green sea turtles.

### 3.2.8 Upland Resources

Existing Conditions

Terrestrial or upland resources are defined as non-marsh or non-wetland areas within the project corridor. At Seabrook, the majority of terrestrial area is owned by the Port of New Orleans and leased as either industrial parcels or unoccupied, formerly industrial sites. All five alternatives would affect limited upland resources in industrial areas that have been previously disturbed, and each would tie in to the existing HSDRRS. Existing HSDRRS areas are regularly mowed to limit the growth of vegetation, and most of the unpaved, upland habitat in the project corridor contains only early successional vegetation, including weeds and small shrubs. These areas occur primarily along the shorelines of the IHNC and are flooded during large storm events.

Land that potentially could be used for staging or access during construction, or the ROW areas identified for increasing the height of existing levees/floodwalls under any of the alternatives, is currently used for industrial and/or municipal (roads, HSDRRS, etc.) purposes and therefore does not support substantial natural communities. None of the land potentially impacted by any of the five alternatives represents natural upland habitat.

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Uplands*

Under the proposed action, approximately 7 acres of upland would be permanently impacted and 10 acres would be temporarily impacted during the construction period (figure 6, table 8). The areas that potentially would be affected by use as staging and access areas or for increasing the height of existing levees and floodwalls are currently in use as industrial properties, roads, levees, and floodwalls and do not support substantial natural communities. Additionally, the project site contains several small paved and landscaped areas, as well as man-made earthen levees, but there are no substantial natural uplands in the project area. The staging area and the areas where the control structure would tie in to LPV 104 and LPV 105 are already mostly paved and in poor condition. The remaining areas for access roads are already in the current levee ROW, which is regularly mowed to prevent over growth of vegetation. Thus, the impacts to upland resources under the proposed action would be minimal.

*Indirect and Cumulative Impacts to Uplands*

No indirect impacts would be anticipated to upland resources in the area. Potential cumulative impacts on upland resources from the proposed action mainly would involve the combined effects from the multiple LPV projects in the New Orleans area. The areas that would be affected in the vicinity of the IHNC are similar to extensive areas of developed upland resources in the New Orleans region. The potentially impacted areas are very small in the context of similar uplands in the region and the proposed action would contribute negligibly to the minimal cumulative impacts on upland resources occurring in the region.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct Impacts to Uplands*

Under alternative #2, approximately 8 acres of upland would be permanently impacted and a slightly larger area compared to the proposed action (11 acres) would be temporarily impacted (table 8). These areas are similar to those required for the proposed action, and therefore the impacts to upland resources under alternative #2 would be similar to those under the proposed action.

*Indirect and Cumulative Impacts to Uplands*

The indirect and cumulative impacts to upland resources under alternative #2 would be essentially the same as under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Uplands*

Alternative #3, which runs through the Turning Basin approximately 1,500 ft south of the Seabrook Bridge, would cross the Port of New Orleans property leased by Cat 5 Composites, a boating manufacture and repair business (USACE 2008c). This abandoned industrial site is covered with gravel or concrete, with weedy growth in any unpaved portions. During construction of alternative #3, approximately 10 acres of uplands would be temporarily impacted, and approximately 9 acres would be permanently lost to the footprint of the control structures (figure 12; table 8). Due to the additional ROW requirements (a permanent loss of approximately 7 acres of uplands) for raising the I-walls to T-walls north of the structure, more upland would be impacted than under the proposed action. The additional ROW required to raise the existing flood walls consists mainly of existing ROW and roadway.

*Indirect and Cumulative Impacts to Uplands*

The indirect and cumulative impacts to terrestrial and upland resources under alternative #3 would be essentially the same as under the proposed action.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Uplands*

Alternative #4, located just south of the Turning Basin, would cross the property leased by Lake Pontchartrain Properties. This property is currently an RV park, with landscaping and utilities for the campers (USACE 2008c). This alignment could impact a total of approximately 26 acres of upland temporarily and permanently; approximately 8 acres would be permanently lost to the floodwalls and associated ROW (figure 13; table 8).

*Indirect and Cumulative Impacts to Uplands*

The indirect impacts under alternative #4 would be greater than with the other alignments due to the number of buried utilities at the RV park. These would all have to be removed and relocated, creating an impact outside the immediate project area. The cumulative impacts to upland resources under alternative #4 would be essentially the same as under the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Uplands*

Alternative #5, located in Lake Pontchartrain to the north of the Seabrook Bridge, would tie in to the existing floodwalls north of the bridge (figure 14). Approximately 2 acres of already paved upland would be permanently covered by the floodwalls, and 13 acres would be temporarily impacted by construction activities (table 8).

*Indirect and Cumulative Impacts to Uplands*

The indirect and cumulative impacts to upland resources under alternative #5 would be essentially the same as under the proposed action.

### 3.2.9 Cultural Resources

<u>Existing Conditions</u>

Cultural Resources are broadly described in section 3.2.14 of the IER #11 Tier 1 document (USACE 2008a) and are herein incorporated by reference. The following discussion provides a location-specific analysis of the Tier 2 Pontchartrain alternatives with respect to cultural resources within the project area.

The CEMVN contracted R. Christopher Goodwin and Associates, Inc. (RCG) to conduct a cultural resources evaluation of the IER #11 - Tier 2 Pontchartrain project area. RCG utilized background research, previous cultural resource investigations review, soil and topographic analyses, and field reconnaissance information to identify high potential areas for archaeological resources and to assess any historic structures and potential historic districts that might be located in the project area (Heller and Hannah 2009).

Background research into records on file at the Louisiana Division of Archaeology and the New Orleans District indicate no previously recorded archaeological sites are located in the Tier 2 Pontchartrain project area. However, site forms and archaeological investigation reports describe known archaeological sites within the project vicinity. Prehistoric shell midden sites have been recorded nearby on the Lake Pontchartrain shoreline along beach ridges and where bayou channels drain into the lake. Due to recent geologic development of the Mississippi delta, the earliest known archaeological sites in the project vicinity date to the Poverty Point period (1700 – 500 B.C.).

Within the greater New Orleans Metropolitan area, historic period archaeological sites and structures, such as forts, plantations, residential neighborhoods, bridges, and industrial facilities initially developed along the high ground adjacent to natural waterways and lake shorelines, and were later established along man-made canals and within drained back swamp areas. Historic period watercraft are recorded in bayous, river channels, and lakes in the region.

Background research indicates two previous cultural resources surveys were conducted within or near the IER #11 - Tier 2 Pontchartrain project area. One survey consisted of an examination of the Lake Pontchartrain and Vicinity Hurricane Protection Levee system (New World Research 1983). No cultural resources were identified in the current project portion of the survey. In the second study, researchers included an evaluation of the Seabrook Railroad Bridge and determined it was eligible for listing on the National Register of Historic Places (NRHP) (Wilson et al. 2006). The Seabrook Railroad Bridge is located in the project area.

Waterway development heavily influenced construction throughout the Tier 2 Pontchartrain project area, particularly the IHNC. Construction of the IHNC began in 1918 and was completed in 1923. The canal provided an improved route between Lake Pontchartrain and the Mississippi River through the use of one of the largest locks in the nation at the time of its construction. In addition, a complex railroad network crosses New Orleans East along Chef Menteur Highway and Hayne Boulevard. New Orleans East subsequently developed into a significant industrial center for the city of New Orleans.

Six cultural resources have been previously documented within the immediate project vicinity, but none are located directly in the project area. These properties include 1) Camp Leroy Johnson site (16OR219), 2) U.S. Army Air Base Building, 3) Downman Road Site (16OR8), 4) Pontchartrain Park Residential Area, 5) Pine Village Residential Area, 6) Lakefront Airport, and 7) Fountain of the Four Winds.

Following the completion of archival research, soil and topographic analysis, and reconnaissance level field investigations, researchers determined that no areas in the Tier 2 Pontchartrain project area possessed the potential to contain buried archaeological deposits and no Phase 1 level investigation was conducted. Only one historic structure was identified in the project area. As mentioned previously, the Seabrook Railroad Bridge is a NRHP eligible steel bascule structure constructed in 1920 on the Norfolk Southern railroad where it crosses over the IHNC. The following discussion of impacts is based on the information provided in the cultural resources investigation management summary prepared by RCG (Heller and Hannah 2009).

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Cultural Resources*

Under the proposed action, construction of the new structures across the IHNC would have no direct impact on cultural resources. The proposed action alignment has been severely impacted by previous construction related to the IHNC and flood protection, including channel excavation, maintenance dredging, land-filling to create shipping and cargo facilities, and earthen levees/floodwalls. The likelihood for intact and undisturbed archaeological sites in the proposed action alignment is considered extremely minimal. Researchers conducting the cultural resources evaluation of the proposed action alignment recommended that archaeological fieldwork was necessary due to these severe ground disturbing activities. No historic structures are located in the proposed alternative alignment.

The CEMVN held meetings with State Historic Preservation Office (SHPO) staff and Tribal governments to discuss the emergency alternative arrangements approved for NEPA project review and formally initiated Section 106 consultation for the HSDRRS, which includes the IER #11, Tier 2 Pontchartrain project, in a letter dated 9 April 2007. In letters to the SHPO and Indian Tribes dated 6 February 2009, the CEMVN provided project specific documentation for Tier 2 Pontchartrain, evaluated cultural resource investigation results, and found that construction of the proposed action would have no adverse impacts on cultural resources. The SHPO concurred with our "no adverse effect" finding a letter dated 20 February 2009. The Choctaw Nation of Oklahoma and the Alabama-Coushatta Tribe of Texas concurred with our effect determination in letters dated 19 February 2009 and 3 March 2009, respectively. No other Indian Tribes responded to our requests for comment. Section 106 consultation for the proposed action is concluded. However, if any unrecorded cultural resources are determined to exist within the proposed action alternative, then no work will proceed in the area containing these cultural resources until a New Orleans District archaeologist has been notified and final coordination with the SHPO and Indian Tribes has been completed.

*Indirect Impacts to Cultural Resources*

Implementation of the proposed action will provide an added level of flood protection to significant historic properties located in the immediate project vicinity, including Camp Leroy Johnson site (16OR219), 2) U.S. Army Air Base Building, 3) Downman Road Site (16OR8), 4) Pontchartrain Park Residential Area, 5) Pine Village Residential Area, 6) Lakefront Airport, 7) Fountain of the Four Winds, and 8) the Seabrook Railroad Bridge. The Seabrook Railroad Bridge is a NRHP eligible steel bascule structure constructed in 1920 on the Norfolk Southern railroad where it crosses over the IHNC just north of the proposed action alignment. Erosion of ground deposits and high water during flood events can result in damage to standing historic structures and archaeological sites.

*Cumulative Impacts to Cultural Resources*

Implementation of the proposed action would have beneficial cumulative impacts on cultural resources in the New Orleans Metropolitan Area. The proposed action is part of the ongoing Federal effort to reduce the threat to property posed by flooding. The combined effects from construction of the multiple projects underway and planned for the HSDRRS would reduce flood risk and storm damage to significant archeological sites, individual historic properties, engineering structures, and nineteen historic districts.

***Alternatives #2 through #5***

*Direct, Indirect, and Cumulative Impacts to Cultural Resources*

Direct, indirect, and cumulative impacts from alternatives #2 through #5 would be essentially the same as those described for the proposed action.

### 3.2.10 Recreational Resources

<u>Existing Conditions</u>

Recreational resources are broadly described in section 3.3.2.10 of the IER #11 Tier 1 document (USACE 2008a) and are herein incorporated by reference. The following discussion provides a location-specific analysis of the Tier 2 Pontchartrain alternatives with respect to recreational resources within the project area. Details regarding the existing conditions and potential impacts to recreational resources associated with particular businesses were gathered largely through interviews with business owners near the project area.

Fishing and boating are the dominant recreational resources within the project area. This section focuses on the *public* recreational activities available in the project vicinity and does not discuss socioeconomic impacts to local *private* businesses that provide recreational services (such as Seabrook Marine, Lake Pontchartrain Properties, or Trinity Yachts). An analysis of socioeconomic impacts is provided in section 3.3 of this document.

Within the project vicinity, primary public recreational activities include:

- Boat fishing in Lake Pontchartrain and the IHNC,
- Fishing from Frank Davis Pier and bank fishing along the IHNC,
- Boating from Lakeshore Park, and
- Passive recreation in Lakeshore Park.

One public boat ramps is located within 5 miles of the Tier 2 Pontchartrain project area; the Seabrook Boat Launch in Lakeshore Park (a collective term for the series of parks located along the south shore of Lake Pontchartrain; figure 36). Two private boat ramps, Seabrook Marine and Trinity Yachts, are located in the project vicinity but outside of the project footprint. These sites are illustrated in figure 36. Private recreational facilities are discussed in further detail in section 3.3.

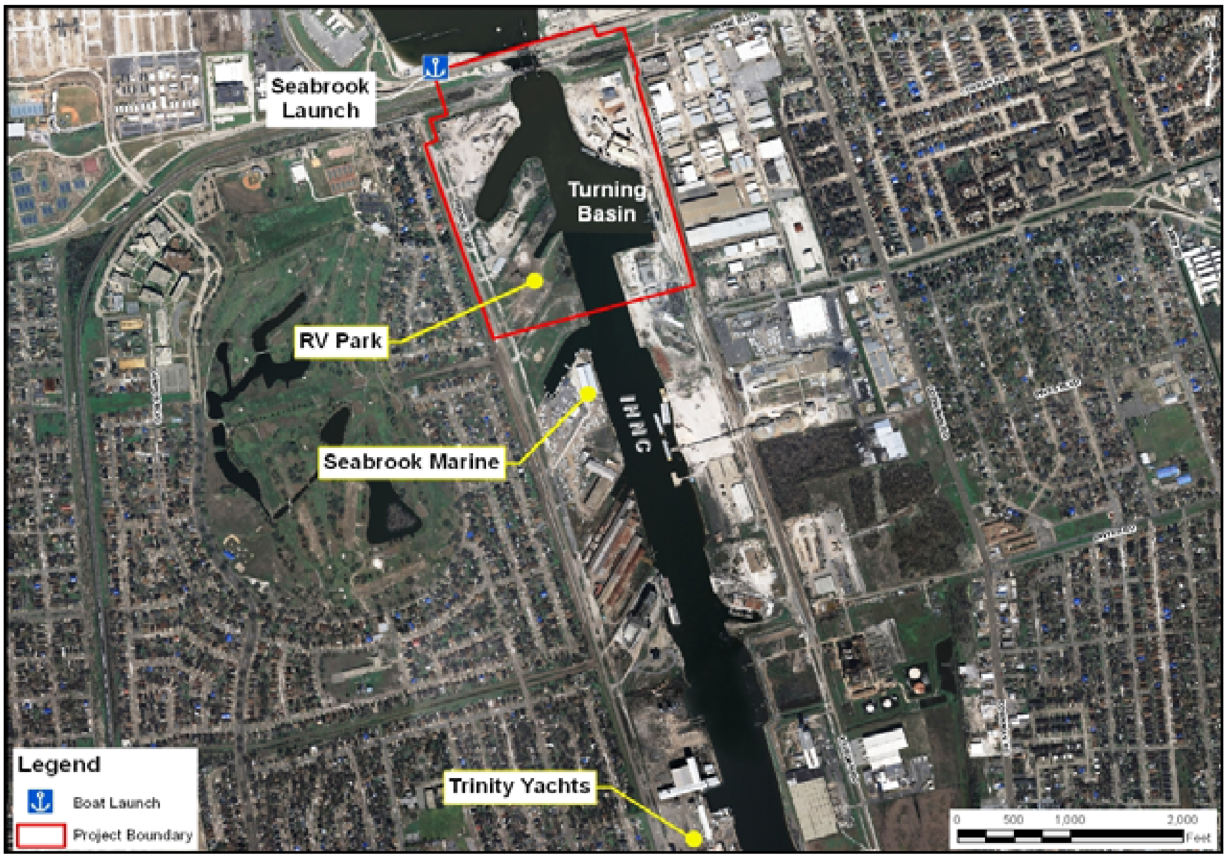



**Figure 36. Recreational Resources in the Project Area**

Fishing boats (including charters) launch from various facilities on the IHNC such as Seabrook Marine and Pontchartrain Landing RV park (figure 36). Fishing boats frequently launch from Seabrook Marine (as many as 65 boats per day on busy summer weekends), and may return several times per day. The RV park at Pontchartrain Landing offers the use of boat ramps for a fee and has had as many as 100 launches per day on a busy weekend.

Fishing is an important recreational resource for the State of Louisiana. In 2003, it supported 16,999 jobs and generated a total economic impact of $1.6 billion (LaDWF 2005b). The project site, an area that is well-known throughout the state for its record trout catches, is a popular fishing spot among local residents. Two deep scour holes located north and south of Seabrook Bridge (figure 7) provide habitat for fish and are frequented by boat fisherman during the summer months.

Seabrook Boat Launch, the launch nearest to the project area, is adjacent to Lakeshore Park, a public recreation area that provides access to activities such as boating, fishing, and birdwatching (photo 2). Seabrook Boat Launch is situated just north of the project location.

**Photo 2. Lakeshore Park public facilities**

The Frank Davis Fishing Pier extends from the shore underneath the Seabrook Bridge and is managed by the Orleans Levee Board (photo 3). This pier is regionally known for catches of white trout, speckled trout, flounder, redfish, sheepshead, black drum, and croaker, primarily due to its proximity to the existing scour holes (Davis 2007). Fishing conditions in the area are also thought to be positively influenced by certain tidal flow patterns, specifically when water moves from the IHNC into Lake Pontchartrain (St. Charles Herald Guide 2008).

**Photo 3. Frank Davis Fishing Pier**

Although fishing occurs within all portions of the IHNC, and the Seabrook area is anecdotally reported to be the second best fishing site in the State. Public access to the shores of the project area is technically restricted and fishing is not allowed. The Port of New Orleans Harbor Police Department (HPD) has established a "No Fishing Zone" for the entire IHNC, which includes restrictions on crabbing, fishing, and shrimping. Despite the posted warnings and the fact that HPD officers have the authority to enforce these laws, fishing does occur within the IHNC at the project location. Currently, there are no health advisories for fish consumption at this location (Louisiana Department of Health and Hospitals [LaDHH] 2008).

Bird-watching is also a popular recreational activity in and around Seabrook. New Orleans Lakefront at Seabrook is listed as an official location (site 7-5) on the Louisiana Birding Trail (America's Wetland 2009). Public benches are provided in Lakeshore Park for bird-watching or passive recreational opportunities.

Numerous recreational areas for adults and children are located near the Tier 2 Pontchartrain project area. As illustrated on figure 37, a total of 16 parks and public recreational areas are located within approximately 2 miles of the project site (City of New Orleans Geographical Information System [CNOGIS] 2007). These parks and playspots are local community facilities accessible to the public.


**Figure 37. Park and Recreation Areas in the Project Vicinity**

Relative to the project location, the closest facilities are Morrison playspot (photo 4) and Pontchartrain Park (photo 5), both on the west side of the IHNC. The 1.7-acre Morrison playspot is approximately 700 ft southwest of the alternative #4 alignment. Currently, this area is undeveloped; however, the Downtown Neighborhood Market Consortium desires to develop the area into a community garden area, including a cypress forest, children's play area, natural wetland, amphitheater, and roadside produce stand (Goldenberg 2008). On the east side of the IHNC in Pines Village, the closest park is Digby Playground, located approximately 1 mile southeast of the project site. This 7-acre playground is a well-developed facility recently rehabilitated for public use (City of New Orleans [CNO] 2008a).

**Photo 4. Morrison playspot**

**Photo 5. Pontchartrain Park**

Pontchartrain Park is a well-developed, approximately 185-acre public facility just west of the Tier 2 Pontchartrain project site (photo 5; figure 37). At its closest point, the boundary of Pontchartrain Park is approximately 630 ft from the western floodwall tie-in associated with alternative #3. The Park is an important recreational resource to the community and to help ensure its continued use, the New Orleans Neighborhood Rebuilding Plan (NOLANRP) has identified numerous redevelopment projects for the Park and area (NOLANRP 2006). Included within Pontchartrain Park are Barrow Stadium and the Bartholomew Golf Course (figure 37). Prior to Katrina, the Wesley Barrow Stadium served as the primary site for the City's Little League teams as well as for local high schools (CNO 2007). The Joe M. Bartholomew Sr. Municipal Golf Course, an 18-hole golf course in the Pontchartrain Park neighborhood, was damaged during Hurricane Katrina and has not re-opened. Originally named the Lake Pontchartrain Golf Course, this course was the only golf course available to African-Americans during the segregation era in New Orleans. By 1979 it had undergone renovations and was renamed the Joe M. Bartholomew Sr. Municipal Golf Course, after Joseph M. Bartholomew, one of the wealthiest African American men in New Orleans at the time. Although it is not currently listed on the National Register of Historic Places (NRHP), neighborhood and civic organizations are pursuing its designation (Greater New Orleans Community Data Center (GNOCDC) 2008a; Pontchartrain Park Neighborhood Association (PPNA) 2008).

The Federal Emergency Management Agency (FEMA), in consultation with the Louisiana SHPO, identifies districts within the City that are eligible for listing in the NRHP. Prior to Hurricane Katrina, Pontchartrain Park was determined eligible for National Register Historic District (NRHD) status (CNO 2006a). The Pontchartrain Park NRHD incorporates Pontchartrain Park and portions of streets on the east side of the park including Prentiss Avenue, Congress Drive, Madrid Street, DeBore Drive, Morrison Road, and Frankfort Street (figure 38).

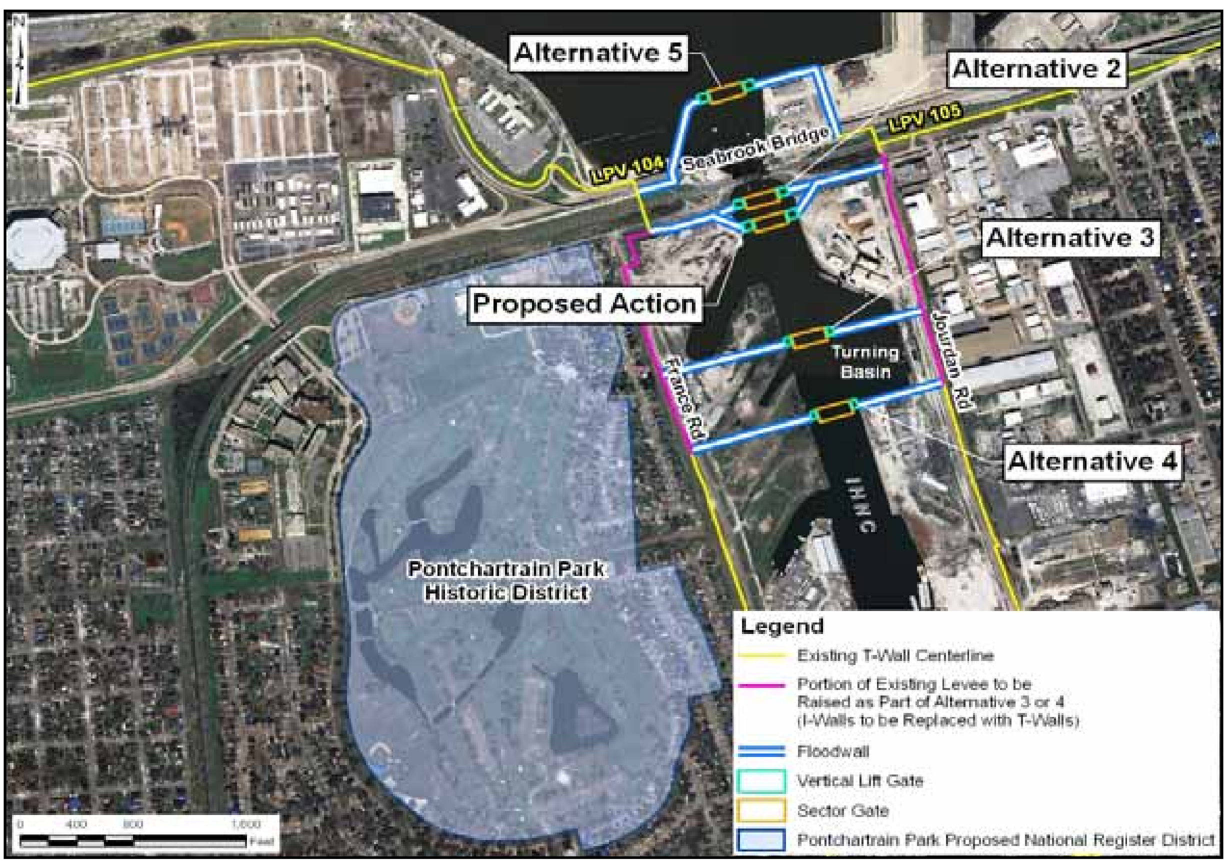



**Figure 38. Map of Pontchartrain Park Historic District**

Discussion of Impacts

To aid in the impact evaluation, multiple interviews were conducted with local users, tenants, and property owners along the IHNC.

The five alternatives would result in roughly equivalent impacts to recreational resources. All impacts would occur during the construction phase with the exception of socioeconomic impacts to the private sector. Following construction, there would be no adverse effects on recreational resources in the project vicinity. Impacts would occur to private boat launches, such as Seabrook Marine and Lake Pontchartrain Properties (RV park), which allow customers to launch their boats for a small fee within the IHNC. Socioeconomic impacts to private boating and fishing related businesses are discussed in section 3.3. This discussion of impacts to recreational resources focuses on impacts to activities that would occur from public facilities, launches, and locations.

***Proposed Action (Alternative #1) – Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Recreational Resources*

Recreational resources would be expected to be temporarily impacted during the 36-month construction period. The most significantly impacted recreational features would be expected to be boating and fishing, as a result of the placement of a cofferdam structure across the entire IHNC channel for approximately 6 months to 12 months. During this time, all boat access and water flow between Lake Pontchartrain and the IHNC would be suspended. Overall impacts to boating would be moderate because the majority of recreational boating occurs in Lake Pontchartrain, not the IHNC. A public boat launch is provided at Seabrook Launch and Lakeshore Park. The proposed action would not preclude access to, or use of those launches for people who wish to access Lake Pontchartrain directly. However, the proposed action would restrict boaters who wish to travel between the lake and the IHNC. While the majority of recreational boating occurs in the lake, boaters commonly seek food and services at commercial resources along the IHNC, including the private boat launch and storage facilities. Impacts to those commercial entities are described in section 3.3, Socioeconomics. Persons who frequently use the private launch facilities on the IHNC to access the lake would either need to bring their boats to the public launch site at Seabrook, if available, or arrive at their destination by an alternative route. It is anticipated that recreational boating within the project area would return to pre-construction levels following the completion of the proposed action.

During construction, the cofferdam would likely reduce the quality of the local fishery for approximately 6 to 12 months, as described in section 3.2.4; thereby, limiting local fishing opportunities. In addition, noise and vibration generated by construction activities may temporarily affect the quality of fishing at the popular north scour hole. Since fishing at the south scour hole is technically prohibited by the Port of New Orleans, filling it would not adversely affect a legally-designated public fishing location. However, filling this scour hole will reduce habitat and refuge sites for certain recreational fishery species and organisms they depend on (as described in section 3.2.4); thereby reducing their availability to recruit into nearby areas where fishing is allowed. Recreational fishing activity may take years to recover due to the time required for recruitment levels and abundance of appropriately-sized individuals to improve.

Passive recreation opportunities are provided at Lakeshore Park. The quality of passive recreation activities such as bird-watching, lake viewing, or social gatherings would be diminished during construction due to noise, vibration, and the presence of large construction equipment in the project area. Swimming is strictly prohibited at Lakeshore Park; therefore, the proposed action would not adversely affect recreational swimming opportunities. Overall, impacts to passive recreation, specifically at Lakeshore Park would be temporary.

Passive recreation also occurs in areas adjacent to the project area such as Pontchartrain Park. Construction of the proposed action would be expected to have a moderate adverse effect (temporary) on passive recreation in these areas. Noise and vibration construction activities could affect the quality of passive recreation activities such as walking or jogging in the park or in adjacent neighborhoods. These impacts would be temporary and somewhat mitigated by the fact that Pontchartrain Park and the adjacent recreational and residential areas are separated from the construction site by an existing concrete levee and retaining wall, which would serve to block some of the noise. Upon completion of construction, there would be no long-term effects to passive recreation in area parks and neighborhoods.

*Indirect Impacts to Recreational Resources*

Indirect visual impact would occur during construction as the construction cranes and equipment may be visible from area parks and neighborhoods. These impacts would be temporary, lasting only during construction of the project. The proposed action would cause both temporary and indirect impacts to the local recreational fishery (section 3.2.4) as a result of the physical disturbances resulting from construction activities, disruption of normal flow patterns, and occasional stressful water quality conditions. The proposed action may cause slight, long-term, indirect impacts to the local recreational fishery because of slight reductions of transport of larval organisms through the passes between Lake Pontchartrain and the Gulf. Reduced dispersion of larval organisms may reduce the abundance and diversity of fish available to anglers in the area.

*Cumulative Impacts to Recreational Resources*

The proposed action would have additive impacts to identified recent and future projects such as closure of the MRGO at Bayou La Loutre and the Borgne Barrier all resulting in a detrimental impact on the local fishery and, thereby, on boat and shore fishing. Recreational fishing may not return to pre-construction conditions, due to the cumulative impacts from the MRGO closure at Bayou La Loutre, the Borgne Barrier, and the proposed action. The closure of the MRGO would likely have the greatest effect on potential declines in fish populations because saline waters from the deep draft channel that previously flowed north into the Lake Pontchartrain were thought to be the reason for the quality of fishing around Seabrook. These effects are described in more detail in section 3.2.4, Aquatic Resources and Fisheries.

The Seabrook Launch, Lakeshore Park, and the Frank Davis Fishing Pier are accessible by vehicle via two routes, an off-ramp of eastbound Leon C. Simon Drive and the eastern terminus of Lakeshore Drive. At present, Lakeshore Drive is closed to through traffic, requiring drivers to exit the park area on Leroy Johnson Drive and connect back to Leon C. Simon Drive. In addition, IER #4, LPV, New Orleans Lakefront Levee West of Inner Harbor Navigation Canal, includes LPV 104, a reach of HSDRRS that runs from the London Avenue Canal to the IHNC at Seabrook. For this project, construction easements required on the eastern side of LPV 104 near the Seabrook Bridge would impact access to the Frank Davis Pier and Seabrook Launch. Vehicle access to the boat ramps under Seabrook Bridge could be disabled due to a reduction in roadway for 10 months to 12 months during floodwall construction; however, the fishing piers would remain accessible to pedestrian traffic.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct, Indirect, and Cumulative Impacts to Recreation Resources*

Direct, indirect, and cumulative impacts from alternative #2 would be similar to those described for the proposed action. Alternative #2 would result in similar impacts to recreational fishing because alternative #2 would impact the same amount of open water as the proposed action (9 acres) but would only partially fill the southern scour hole. These project components would slightly reduce the impacts to the local recreational fishery that recreational fishing relies on.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Recreational Resources*

Under alternative #3, direct impacts to recreational fishing would be similar to but generally less than those described for the proposed action. Alternative #3 would impact approximately 12 acres of open water habitat for recreational species as opposed to 9 acres for the proposed action, resulting in a greater reduction of habitat for many fisheries species. This alternative does not require any scour holes to be filled in; therefore, negative habitat and water quality impacts associated with that component of the proposed action would not occur under alternative 3. In addition, the cofferdam would only partially block flow between the IHNC and Lake Pontchartrain, resulting in fewer impacts to recreational fishing.

Alternative #3 would also result in impacts to privately-owned Lake Pontchartrain Properties (RV park) and the Seabrook Marina, as discussed in detail in section 3.3, Socioeconomics.

*Indirect Impacts to Recreational Resources*

Indirect impacts from construction of alternative #3 would likely be similar to those described for the proposed action. Increases in disturbance to water clarity, salinity, and DO associated with the 3-month longer construction time (as described in section 3.2.4) could result in additional indirect impacts to recreational fishing.

*Cumulative Impacts to Recreational Resources*

Cumulative impacts to recreation from alternative #3 would be the same as those described for the proposed action with the exception of impacts associated with filling the scour hole and the cofferdam completely blocking flow.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Recreational Resources*

Alternative #4 would result in similar impacts to recreational fishing as those that were described under the proposed action. However, alternative #4 would impact slightly more open water habitat for recreational fishery species than the proposed action (10 acres versus 9 acres). None of the positive or negative impacts on the recreational fisheries (section 3.2.4) or recreational fishing associated with filling the scour hole would occur under alternative #4.

Under alternative #4, the privately-owned RV park and its tenants, as well as Seabrook Marine, could be negatively impacted. Impacts to these private facilities are further discussed in section 3.3, Socioeconomics.

*Indirect Impacts to Recreational Resources*

Alternative #4 would result in indirect recreation impacts similar to those described for the proposed action.

*Cumulative Impacts to Recreational Resources*

Cumulative impacts related to alternative #4 would be the same as were described for the proposed action with the exception of impacts associated with filling the scour hole.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Recreational Resources*

Alternative #5 would impact significantly more open water habitat for recreational fishery species than the proposed action (19 acres versus 9 acres). In addition, the northern scour hole is larger, deeper, and more accessible from other habitats. Therefore, the partial filling of it is likely to negatively impact more recreational fishing species and recreational fishing than the proposed action.

The construction of alternative #5 requires a floodwall to be built in the vicinity of the Frank Davis Fishing Pier and Seabrook Boat Launch in Lake Pontchartrain. As a result, these resources could have to be permanently relocated from their current locations.

*Indirect Impacts to Recreational Resources*

Alternative #5 would require partial fill of the north scour hole, which could detrimentally alter fish habitat in that area. Alternative #5 would further impact fishing opportunities and behavior of both boat and shore fishermen, most likely due to the additional structures(s) in the footprint of this alternative. These impacts would last longer due to the extended construction schedule (45 months) for this alternative. Maintaining flow during construction would reduce fish kills and have less negative effect on the behavior, growth rate, feeding, recruitment, and growth to maturity of recreational fishery species (section 3.2.4), thereby maintaining a sufficient population to support recreational fishing in the area during construction.

*Cumulative Impacts to Recreational Resources*

Cumulative impacts related to alternative #5 would be the same as were described for the proposed action with slight additional impacts to water quality and the recreational fishery due to placement of the alignment in the lake and required partial filling of the northern scour hole. Although the construction period for this alternative may be longer than that of the proposed action, phased construction would maintain flow between the IHNC and the lake throughout construction.

### 3.2.11 Aesthetic (Visual) Resources

Existing Conditions

The Seabrook–Lake Pontchartrain project area is characterized by urbanized and industrial development. The IHNC is a man-made canal, rather than a natural waterway, and is highly developed for industrial uses on both shores in the vicinity of the project area. Visually, the project area is dominated by two transportation infrastructure components (bridges) at the north end of the area, with open water for the remainder of the project area. Earthen berm levees and floodwalls line both shores of the IHNC. Along the shores are warehouses, a rock grinding plant, a cement distribution plant, and boat repair and storage yards. Many of the remaining industrial facilities were constructed in the 1950s and some retain visual signs of damage from Hurricane Katrina.

Recently, however, land use in the vicinity of the project area has begun to change. On the west side of the IHNC, there has been an addition of a privately-operated RV park on property owned by the Port of New Orleans. This notable change in the visual landscape represents a possible future trend in accordance with long-range plans for the area to convert the west shore of the IHNC into more recreational uses, while retaining industrial uses on the east shore (CNO 2008b and 2008c). Other uses along the west shore of the IHNC in the project area blend recreational and industrial uses such as Seabrook Marina and Trinity Yachts. Seabrook Marina serves both recreational and industrial needs with boat launch and storage facilities and boat repair facilities. Trinity Yachts constructs large yachts for private customers and is largely characterized visually as a manufacturing site.

On the west side of the IHNC in the project area, residential development abuts the protected side of the existing HSDRRS. As further described in section 3.3, Socioeconomic Resources, of this document, these homes are at a lower elevation than the IHNC. Only a few two-story home rooftops approach the height of the HSDRRS; most are several feet below the height of the levee wall. Therefore, virtually none of the project area is directly visible from the residential areas.

At the northern end of the project area, where the IHNC enters the lake, the visual setting along the Lake Pontchartrain shoreline is a mixture of industrial and recreational. On the east, the lake shoreline is visually dominated by the Lakefront Airport, in particular the jet fuel storage area. On the west the lakeshore is undeveloped with an open, natural visual setting. This shoreline supports recreational land uses, including Lakeshore Park, Seabrook Boat Launch, and the Frank Davis Fishing Pier underneath the Seabrook Bridge. There are no natural resources designated for visual protection within the project area.

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct, Indirect, and Cumulative Impacts to Aesthetic Resources*

Construction of the proposed flood control structure would have a minimal impact on visual resources. The visual attributes of the project area would be temporarily impacted by construction activities at the project site and the transportation of equipment and materials in the project area. Construction of the proposed flood control structure would take place within an existing industrial area. The visual character of the project area would be minimally different from current conditions. Although the proposed action would introduce a new visual element, that element would be consistent with the predominant industrial nature of development in the vicinity. The visual element of the proposed flood control structures would parallel the existing bridge infrastructure and crossings to the north. The new elements would not be directly visible from the streets in the nearby residential areas such as in the Pontchartrain Park community. No indirect impacts would be anticipated to visual resources in the area. Construction activities, including the presence of construction equipment, associated with other HSDRRS projects in combination with numerous renovation and rebuilding projects in the area would have cumulative temporary impacts on visual resources in the New Orleans area.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct, Indirect, and Cumulative Impacts to Aesthetic Resources*

The effects on visual resources from alternative #2 would be similar to those described for the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Aesthetic Resources*

The effects on visual resources from alternative #3 would be similar to those described for the proposed action. However, under alternative #3, the new element would be more visible as it would span a greater area of open water.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Aesthetic Resources*

The effects on visual resources from alternative #4 would be similar to those described for the proposed action. However, the structure would essentially divide the RV park in two, introducing a strong visual element in a location where people rent sites to park recreational vehicles. While the setting is currently primarily industrial, introduction of a new visual element spanning the IHNC would significantly detract from the visual enjoyment as viewed from the RV park.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Aesthetic Resources*

The effects on visual resources from alternative #5 would be greater than those described for the proposed action. Construction of alternative #5 would introduce a new, industrial visual element into the Lake Pontchartrain shoreline that would be clearly visible from the surrounding area, in particular from Lakeshore Park east of the project area. The scale and proximity of the new sector gate and vertical lift gates would create an industrial presence at a prime viewshed in the area, the Seabrook Bridge crossing over the IHNC. Currently, the views from the bridge are of an open connection to Lake Pontchartrain. This view would be disrupted by the new structures. There would be minimal cumulative impacts on visual resources from nearby HSDRRS projects along the Lake Pontchartrain shoreline. To the west at LPV 104, existing floodwalls and gates would be replaced by walls and gates constructed at a higher elevation and with a floodside shift away from the shoreline. To the east at LPV 105, the existing floodwall, which is located behind the Lakefront Airport, would be replaced by a T-wall constructed at a higher elevation and south of the existing alignment. These proposed structures would not change the visual character of the lake shoreline.

### 3.2.12 Air Quality

The USEPA, under the requirements of the Clean Air Act of 1963 (CAA), has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 CFR 50). These are carbon monoxide (CO), nitrogen dioxide ($NO_2$), ozone ($O_3$), particulate matter (less than 10 microns in diameter [$PM_{10}$] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), lead (Pb), and sulfur dioxide ($SO_2$). The NAAQS include primary and secondary standards. The primary standards were established at levels sufficient to protect public health with an adequate margin of safety. The secondary standards were established to protect the public welfare from the adverse effects associated with pollutants in the ambient air. The primary and secondary standards are presented in table 12.

**Table 12.**
**National Ambient Air Quality Standards**

| Pollutant and Averaging Time | Primary Standard | | Secondary Standard | |
|---|---|---|---|---|
| | μg/m³ | parts per million (ppm) | μg/m³ | ppm |
| Carbon Monoxide | | | | |
| 8-hour concentration | 10,000[1] | 9[1] | - | |
| 1-hour concentration | 40,000[1] | 35[1] | - | |
| Nitrogen Dioxide | | | | |
| Annual Arithmetic Mean | 100 | 0.053 | Same as primary | |
| Ozone | | | | |
| 8-hour concentration | 147 | 0.075[2] | Same as primary | |
| Particulate Matter | | | | |
| $PM_{2.5}$: | | | | |
| Annual Arithmetic Mean | 15[3] | - | Same as primary | |
| 24-hour Maximum | 35[4] | - | | |
| $PM_{10}$: | | | | |
| Annual Arithmetic Mean | 50 | - | | |
| 24-hour concentration | 150[1] | - | | |
| Lead | | | | |
| Quarterly Arithmetic Mean | 1.5 | - | Same as primary | |
| Sulfur Dioxide | | | | |
| Annual Arithmetic Mean | 80 | 0.03[1] | - | - |
| 24-hour concentration | 365[1] | 0.14[1] | - | - |
| 3-hour concentration | - | - | 1300[1] | 0.50[1] |

*Source*: 40 CFR 50.

Notes:

[1] Not to be exceeded more than once per year.

[2] 3-year average of the 4th highest daily maximum 8-hour concentration may not exceed 0.075 ppm, effective as of 27 March 2008.

[3] Based on 3-year average of annual averages.

[4] Based on 3-year average of annual 98th percentile values.

*National Ambient Air Quality Standard Attainment Status*

Areas that meet the NAAQS for a criteria pollutant are designated as being “in attainment;” areas where a criteria pollutant level exceeds the NAAQS are designated as being “in non-attainment.”

The proposed action and alternative actions evaluated in this document would occur in Orleans Parish, Louisiana, an area that is currently designated as “in attainment” for all criteria pollutants. Further analysis required by the CAA general conformity rule (Section 176(c)) would not be required.

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Air Quality*

During construction of the proposed action, increases in air emissions near the project area could be expected during the construction period of approximately 36 months. These emissions could include: (1) exhaust emissions from operations of various types of non-road construction equipment such as loaders, excavators, cranes, etc. and (2) fugitive dust due to earth disturbance. These emissions would be from mobile sources for which emissions performance standards would be applicable to source manufacturers, and they are not regulated under the CAA air permit regulations.

The principal air quality concern associated with the proposed action is emission of fugitive dust near demolition and construction areas. The on-road trucks and private autos used to access the work area would also contribute to construction phase air pollution in the project neighborhood when traveling along local roads.

However, site-specific construction effects would be temporary and dust emissions would be controlled using BMPs. Construction activities related to the proposed action would not occur all at once, but would be phased throughout the construction period. Construction activities would be similar to those activities that have been ongoing throughout New Orleans since Hurricane Katrina.

*Indirect Impacts to Air Quality*

Under the proposed action, there would be no adverse indirect impacts to air quality within the project area.

*Cumulative Impacts to Air Quality*

It is expected that standard BMPs would be used for other activities or projects occurring within the vicinity of the Tier 2 Pontchartrain project area that could potentially create dust emissions. For instance, application of water to control dust and periodic street sweeping and/or wetting down of paved surfaces would aid in preventing fugitive dust from becoming airborne. Other construction activities occurring during the same timeframe and within the vicinity of the proposed action would likely occur incrementally throughout the construction period. Therefore, cumulative impacts to air quality in the project area from the proposed action and other construction activities in the area that could be occurring concurrently would be temporary. Once construction of the proposed action is complete, there would be no continued impacts to air quality, and therefore no contribution to cumulative air quality effects in the area.

***Alternatives #2 through #5***

*Direct, Indirect, and Cumulative Impacts to Air Quality*

The direct, indirect, and cumulative impacts to air quality under alternatives #2 through #5 would be similar to those described for the proposed action; however, the construction duration for alternative #5 is estimated to be approximately 9 months longer than that of the proposed action. This would result in an extended period of temporary construction-related air quality impacts in the project vicinity.

### 3.2.13 Noise

Existing Conditions

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by USEPA and has been adopted by most Federal agencies (USEPA 1974). A DNL of 65 weighted decibels (dBA) is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction. The A-weighted sound level, used extensively in this country for the measurement of community and transportation noise, represents the approximate frequency response characteristic of an average young human ear. Areas exposed to a DNL above 65 dBA are generally not considered suitable for residential use. A DNL of 55 dBA was identified by USEPA as a level below which there is no adverse impact (USEPA 1974).

Noise levels occurring at night generally produce a greater annoyance than do the same levels occurring during the day. It is generally agreed that people perceive intrusive noise at night as being 10 dBA louder than the same level of noise during the day. This perception is largely because background environmental sound levels at night in most areas are about 10 dBA lower than those during the day.

Noise would be regulated in accordance with the City of New Orleans Ordinance 23263, Chapter 66, Article IV regarding noise.

The Tier 2 Pontchartrain project is located in an industrial portion of the New Orleans Metropolitan area, adjacent to a four-lane highway. Existing noise in the Seabrook area results from not only vehicle and boat traffic (horns), train activity, and nearby airport traffic, but also from the heavy industrial uses of the shoreline property. Noise levels surrounding the project corridor would vary depending on climatic conditions and the time of day (typically traffic is heavier at specific times and industries operate during normal business hours). Areas to the north of the project corridor primarily consist of open water (Lake Pontchartrain) and parkland with minimal noise generated by recreational users. Areas to the east are primarily industrial, and the entire western boundary of the project corridor is occupied by Pontchartrain Park residential neighborhood. Located in the southwest corner of the project corridor is Pontchartrain Landing RV park.

Table 13 describes noise emission levels for construction equipment that would be expected to be used during Tier 2 Pontchartrain construction activities, regardless of the alternative. As can be seen from table 13, the anticipated noise levels at 50 ft range from 76 dBA to 101 dBA based on data from the Federal Highway Administration (FHWA 2006).

One construction activity, pile driving, would be expected to create temporary noise impacts above 65 dBA to sensitive receptors within 1,000 ft of the project corridor. Assuming the worst case scenario of 101 dBA (pile driver), as would be the case during the construction of floodwalls along the project corridor, all areas within 1,000 ft of the project corridor would experience noise levels exceeding 65 dBA. There are many residences and industrial facilities within 1,000 ft of the project corridor. For reference, the Pontchartrain Park homes nearest to the west end of the proposed action are located approximately 300 ft away, while the RV park is approximately 2,000 ft south of the proposed action. Construction noise levels would attenuate to 75 dBA at a distance of 350 ft from construction activities. For BMPs while pile driving, the USACE may use a quiet hydraulic machine to aid in reducing the adverse impact of noise on surrounding land uses, during the HSDRRS projects.

**Table 13.**
**Weighted (dBA) Sound Levels of Construction Equipment and Modeled Attenuation at Various Distances[1]**

| Noise Source | 50 ft | 100 ft | 200 ft | 500 ft | 1,000 ft | 3,155 ft | 9,975 ft |
|---|---|---|---|---|---|---|---|
| Backhoe | 78 | 72 | 68 | 58 | 52 | 42 | 32 |
| Crane | 81 | 75 | 69 | 61 | 55 | 45 | 35 |
| Dump Truck | 76 | 70 | 64 | 56 | 50 | 40 | 30 |
| Excavator | 81 | 75 | 69 | 61 | 55 | 45 | 35 |
| Front end loader | 79 | 73 | 67 | 59 | 53 | 43 | 33 |
| Concrete mixer truck | 79 | 73 | 67 | 59 | 53 | 43 | 33 |
| Auger drill rig | 84 | 78 | 72 | 64 | 58 | 48 | 38 |
| Dozer | 82 | 76 | 70 | 62 | 56 | 46 | 36 |
| Pile driver | 101 | 95 | 89 | 81 | 75 | 65 | 55 |
| Quiet hydraulic machine | 66 | 60 | 54 | 46 | 40 | 30 | 20 |

Notes: The dBA at 50 ft is a measured noise emission. The 100- to 9,975-ft results are modeled estimates for all sources except the quiet hydraulic machine, for which all results are modeled estimates based on a known noise emission of 69 dB at 23 ft.
*Source:* Highway Construction Noise Handbook (FHWA 2006).

Discussion of Impacts

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Noise*

Construction activities would be expected to create temporary noise impacts above 65 dBA to the sensitive receptors within 1,000 ft of the project corridor; however the majority of the noise will result from specific activities such as pile driving, which would not last the entire length of the construction period. While fewer than 50 homes within the Pontchartrain Park neighborhood are located within 1,000 ft of the western-most end of the proposed action alignment, these residents would experience temporary noise impacts during construction. The RV park is not within the 1,000 ft receptor radius, as is the case with the majority of businesses along the east bank of the IHNC, with the exception of Halliburton. Halliburton, a facility which grinds barite and bentonite for use in drilling mud, is adjacent to the proposed action footprint and would be expected to experience temporary noise impacts from construction. In addition to noise created by construction equipment, there would also be impacts from noise generated by construction vehicles and personal vehicles for laborers that could use public roads and highways for access to constructions sites. Existing noise in the project area would continue to occur; however, noise from boat horns would be minimized while the IHNC pass is closed during cofferdam placement. Following construction, noise levels would return to existing conditions.

*Indirect Impacts to Noise*

Potential indirect impacts from noise include those related to residents, traffic, fishermen, avoidance of the area by wildlife, and emotional and mental stress that could result from on-going high levels of noise. Most of these impacts, with the exception of the emotional and mental stress, are discussed in other sections of this document corresponding to the resource being impacted by the construction-related noise levels. Emotional and mental stresses from increased noise levels are difficult to assess; however, it is reasonable to assume that the emotional and mental stress created by noise levels would be compensated by the relief associated with the hurricane risk reduction provided by the project.

*Cumulative Impacts to Noise*

Noise resulting from current and planned construction activities in the IER #11 Tier 2 Pontchartrain area as a result of HSDRRS projects and rebuilding/restoration following Hurricanes Katrina and Rita would not likely cause noise levels in the project area to exceed the maximum levels described previously under direct impacts. However, overlapping projects could extend the length of time people would be exposed to increased levels of noise.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct, Indirect, and Cumulative Impacts to Noise*

The direct, indirect, and cumulative impacts to noise from alternative #2 would be similar to those described for the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Noise*

Alternative #3 is located approximately 1,000 ft further south in the IHNC than the proposed action or alternative #2 and both Pontchartrain Park residential neighborhood and the recreational RV community fall within the 1,000 ft project corridor. Under this alternative, the visitors and/or residents of the RV park would be impacted by construction-related noise, but only temporarily and BMPs would be employed to help minimize noise impacts. Higher levels of background (existing) noise would be expected under this alternative compared to the proposed action, given its alignment through the Turning Basin. The west end of alternative #3 would tie-in into a highly industrial area and the Turning Basin is frequented by large barges and equipment used for delivering, loading, and unloading industrial materials. In addition, a scrap metal recycling plant, Southern Scrap, is located just south of alternative #3, which would also contribute to higher levels of ambient noise.

*Indirect and Cumulative Impacts to Noise*

Indirect and cumulative impacts to noise from alternative #3 would be similar to those described under the proposed action.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Noise*

Noise impacts from alternative #4 would primarily affect the Pontchartrain Landing RV park given the location of the alignment essentially directly through the park. During the construction period, noise could reach levels high enough that visitors and/or residents would no longer be able to remain at the RV park in comfort. This could result in further indirect socioeconomic impacts to the RV park and any other businesses in the area that depend on people visiting or residing in the park. These impacts are discussed in more detail in section 3.3, Socioeconomics. Cumulative impacts would be similar to those described under the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct, Indirect, and Cumulative Impacts to Noise*

The location of alternative #5 in Lake Pontchartrain (not in the IHNC behind the existing HSDRRS floodwalls as is the case for alternatives #1 through #4) would allow noise from construction activities to travel further, thereby causing temporary, minor direct impacts greater than those for alternatives #1 through #4. Existing HSDRRS structures along the lakeshore are set back from the shoreline and would allow noise to travel across the lake, resulting in impacts to a larger area. Without nearby floodwalls such as those along the IHNC to absorb construction noise, the sounds would refract off the open body of Lake Pontchartrain. Since there are no residential communities along the shore of Lake Pontchartrain directly east or west of the alternative #5 alignment, direct noise effects are likely to only impact recreational users in the Seabrook area during construction. However, the construction duration for alternative #5 is estimated to be approximately 9 months longer than that of the proposed action. This would result in an extended period of temporary construction-related noise impacts in the project vicinity.

The indirect and cumulative impacts to noise from alternative #5 would be similar to those described for the proposed action.

### 3.2.14 Transportation

<u>Existing Conditions</u>

The project area lies south of Lake Pontchartrain at the northern end of the IHNC in Orleans Parish, Louisiana. Orleans Parish is densely developed with residential, commercial, and light to medium industrial land uses. To the southwest, the Port of New Orleans is one of the world's busiest ports with many transportation modes intersecting: river and sea vessels, rail, and highway (Port of New Orleans 2009). A more detailed discussion of navigation transportation infrastructure can be found in section 3.3.1, Navigational Resources, within section 3.3, Socioeconomic Resources.

On the east side of the IHNC, the New Orleans Lakefront Airport extends into Lake Pontchartrain. The airport is designated as a general aviation airport but also serves military and commercial aircraft. The Louis Armstrong New Orleans International Airport is located approximately 14 miles west of the project area, on the west side of Jefferson Parish, and is the primary commercial airport for the New Orleans Metropolitan area and southeast Louisiana. Light to heavy industrial land uses are located along the Mississippi River, IHNC, and GIWW.

There are several rail lines in the New Orleans Metropolitan area. There is a major rail line that runs parallel to Interstate 10 (I-10), and a Norfolk Southern-owned rail line crosses the IHNC at Seabrook. The New Orleans Public Belt Railroad operates two rails running north/south along the east and west banks of the IHNC, but their lines do not join with the Norfolk Southern line. There are several dock facilities on the Mississippi River, IHNC, and the GIWW that would be capable of handling ocean vessels. The Mississippi River is approximately 5 miles to 8 miles south of the project area.

I-10 and US-90 are the major east-west highways that cross this area (figure 39). I-10 is a six-lane divided freeway that connects the New Orleans Metropolitan area with Baton Rouge to the west and Mississippi to the east. Baton Rouge, the state capital and second largest city in Louisiana, is a major traffic generator to the west of the project area. In addition, I-10 is a major east-west route along the northern Gulf Coast. US-90 is a six-lane divided highway with no access control. It runs parallel to I-10 in this area, and primarily serves local travel, while I-10 serves regional travel.

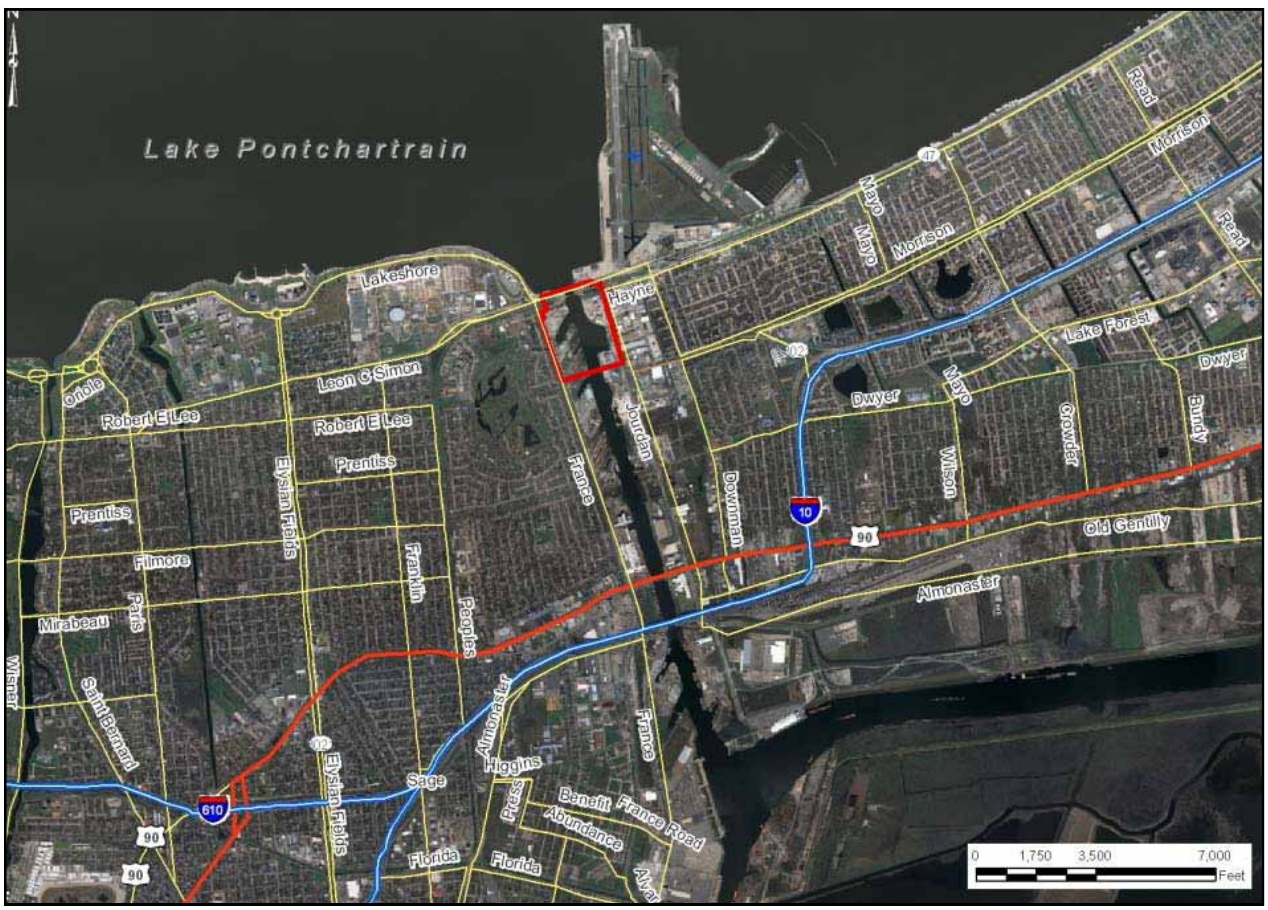



Figure 39. **Major Roads and Highways near the Tier 2 Pontchartrain Project Area**

Leon C. Simon Boulevard, Lakeshore Drive, and Hayne Boulevard provide access to the project area from the north. Leon C. Simon Boulevard, classified as a "principal arterial," is a 4-lane, divided, urban street with no control of access. Lakeshore Drive, a 4-lane, urban street with parkway-like features, is classified as a "minor arterial" and Hayne Boulevard is classified as an "urban collector" (Louisiana Department of Transportation and Development [LaDOTD] 2009a). Roads that connect I-10 and US-90 to the project area are France Road, Jourdan Road, and Downman Road, classified as principal arterials, and Franklin Avenue, a minor arterial (LaDOTD 2009a). I-10 and US-90 are likely routes into the project area (figure 39), although transportation routes for delivering construction materials have not been fully determined.

Operational conditions on a highway can be described with "level-of-service" (LOS). LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. The "Highway Capacity Manual" (Transportation Research Board [TRB] 2000) defines six LOS, designating each level with the letters A to F. LOS "A" represents the best operating condition, and LOS "F" represents the worst operating condition. LOS "C" or "D" is generally considered acceptable. Heavy trucks adversely affect the LOS of a highway. "Heavy trucks" are vehicles that have more than four tires touching the pavement. Heavy vehicles adversely affect traffic in two ways: (1) they are larger than passenger cars and occupy more roadway space; and (2) they have poorer operating capabilities than passenger cars, particularly in respect to acceleration, deceleration, and the ability to maintain speed on grades. The second impact is more critical. The inability of heavy vehicles to keep pace with passenger cars in many situations creates large gaps in the traffic stream, which are difficult to fill by passing maneuvers. The resulting inefficiencies in the use of roadway space cannot be completely overcome.

The most recent traffic volumes available from the LaDOTD are from 2008 (LaDOTD 2009b). Due to a population shift and additional construction activity that occurred in the 2005 aftermath of Hurricane Katrina, these traffic volumes may not be suitable for finitely determining the existing LOS of area highways. However, they provide an order-of-magnitude baseline for comparison when trucks associated with construction of the floodgates and floodwalls are added. The latest traffic counts for I-10 in its closest proximity to the project area are 58,800 to 74,400 vehicles a day. The two traffic counts for US-90 (Chef Menteur Highway) in the project area are 19,900 and 25,200 vehicles a day.

Discussion of Impacts

A single primary staging area has been proposed for the project area: an area immediately west of the site and south of the Bascule Railroad Bridge, between France Road and the IHNC (blue-shaded area on figure 6). Road access to this staging area would be from France Road, likely either via US-90 from the south or Hayne Boulevard from the north. In addition, barges are capable of accessing this site either from Lake Pontchartrain to the north or from the IHNC to the south, and the portion of the staging area in Slip No. 6 (figure 6) has been designated as a potential, temporary mooring location for the unloading and offloading of construction materials. While large quantities of construction materials would be staged within the designated area, the sources for these materials and the transportation routes for delivering them have not been fully determined. The following impacts to transportation are based on available information, and all new data will be reviewed as it becomes available. The CEMVN is currently completing a system-wide transportation analysis to better quantify impacts.

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Transportation*

Construction equipment would be required to conduct the work, including, but not limited to, generators, barges, boats, cranes, trucks, bulldozers, excavators, pile hammers, graders, tractors, and front-end loaders. The main staging area is located northeast of Pontchartrain Park (figure 6), a suburban neighborhood that lies along the entire western boundary of the project corridor. Two primary streets, Press Drive and Congress Drive, run through the neighborhood from US-90 (Chef Menteur Highway). These two roads, however, are not directly on the likely haul routes south of the staging area. Industrial lands on the western side of the IHNC are vacant or cleared; Pontchartrain Landing RV park, however, is located southwest of the project corridor and accessed via France Road. Recreational boating is popular among RV park tenants, making the on-site public launch very active; busy weekends sometimes see as many as 100 launches a day. However, with the temporary closure of the IHNC at Seabrook, access to and from Lake Pontchartrain would be impeded for approximately 6 months to 12 months. Recreational boating-related traffic would be reduced and construction traffic would not be expected to directly impact the traffic flow in this area. Along the east bank of the IHNC several industries are active, and the Pines Village Neighborhood residential area is located further to the east. Although exact haul routes are not yet known, the most direct routes to the project area would likely avoid these areas; therefore direct impacts from construction traffic are not expected to occur.

Construction traffic could possibly use Hayne Boulevard north of the staging area, along with the use of the IHNC, Lake Pontchartrain, I-10, and US-90. Equipment and materials would most likely come from outside the study area. The only major roads that provide access to the study area are I-10 and US-90, with Hayne Boulevard being the likely choice for local suppliers. Any materials or equipment being delivered to the project site via the Mississippi River would likely be offloaded to the staging area from the mooring facility in Slip No. 6 in the IHNC (figure 6) instead of being unloaded and hauled by truck up to the staging area. Materials and equipment could also be transported to the study area via the New Orleans Public Belt Railroad, which operates rails running north/south along the east and west banks of the IHNC.

Most of the truck traffic associated with the proposed action would likely use US-90 and I-10; US-90 is assumed to be the worst case. Impacts to highway capacity can be predicted using the methodology from the Highway Capacity Manual for multi-lane highways. Two models were built – Base and Additional Trucks – to evaluate the highway capacity impacts that additional trucks would have to US-90. The “Base” model looked at future conditions with no action, which serves as a comparison. The “Additional Trucks” model looked at the future conditions and calculated the number of trucks that were operating in addition to the “Base” traffic stream during the peak hour. It was assumed that there are 19,900 vehicles per day in the “Base” condition, based on traffic volumes from LaDOTD (2009b), 10 percent of which are operating in the peak hour, 5 percent of the base vehicles are trucks, and base free-flow speed is 47 mph. For the “Additional Trucks” model, 8 trucks per hour in each direction were added to the “Base condition.” For the “Base” and “Additional Trucks” models, US-90 would operate at LOS “B.” The additional truck traffic would have a temporary impact on the LOS for US-90. After construction is complete, the proposed action would have no long-term impact on transportation.

Local streets would be used to access work sites from the arterials. The access roads used by the trucks to access the work site and staging area could have substantial changes in their LOS. It should be noted that without a detailed transportation routing plan, a more specific evaluation of impacts on the LOS of minor highways and roads cannot be done; however, this information will be included in the draft CED. Additionally, it can only be presumed that increases in traffic in the Tier 2 Pontchartrain project area could potentially increase traffic accidents and related traffic fatalities. However, a slow-down in traffic due to the construction activities in the project area would also reduce speeds and thereby reduce traffic accident-related fatalities.

*Indirect Impacts to Transportation*

Heavy trucks are the primary loading source causing pavement degradation. The additional truck traffic resulting from the proposed action could contribute to additional wear-and-tear of paved roads within the project vicinity. Additionally, traffic delay and accidents may increase.

*Cumulative Impacts to Transportation*

Additional wear-and-tear of paved roads within the project vicinity could occur due to increased truck traffic under the proposed action. On-going construction related to other reconstruction projects in the Seabrook area would also contribute to increased truck traffic, which would therefore increase wear-and-tear on roads and add to area congestion. A single lane of Hayne Boulevard may be closed during a portion of construction for IER #6, which is located along the south shore of Lake Pontchartrain adjacent to the east end of the proposed Tier 2 Pontchartrain alignment. This could add to traffic congestions anticipated on Hayne Boulevard and may increase the risk of accidents.

***Alternatives #2 through #5***

*Direct, Indirect, and Cumulative Impacts to Transportation*

The direct, indirect, and cumulative impacts to transportation from alternatives #2 through #5 would be similar to those described under the proposed action. The construction duration for alternative #5 is estimated to last approximately 9 months longer than that of the proposed action, which could result in increased construction traffic on the small access roads on the east and west sides under the Seabrook Bridge. The majority of the footprint of alternative #5 is located within Lake Pontchartrain and on Lakefront Airport property; therefore, barges would be utilized for delivery of a large portion of materials and the portion of construction occurring on airport property would not require public roads to be temporarily impacted.

## 3.3 SOCIOECONOMIC RESOURCES

<u>Existing Conditions</u>

The socioeconomic conditions of the project area are broadly described in section 3.3 of the IER #11 Tier 1 document. Additionally, updated socioeconomic data was provided in IER #11 Tier 2 Borgne. These data are summarized but are not repeated in this document. The socioeconomic descriptions that follow refresh the analysis provided in the IER #11 Tier 2 Borgne document, and then focus on the immediate project area to the east and west of the IHNC at Seabrook. Details regarding the existing conditions and potential impacts to socioeconomic resources associated with particular businesses were gathered largely through interviews with business owners near the project area.

- By December 2008, the population of New Orleans reached 73.7 percent of pre-Katrina levels as indicated by the number of households actively receiving mail. Orleans Parish accounted for most of this growth gaining a total of 5,478 households throughout 2008 (GNOCDC 2008c). Orleans Parish is estimated to have approximately 70 percent of pre-Katrina population (UNO) 2008a, UNO 2008b).

- By the end of the third quarter of 2008, real Gross Domestic Product fell by 0.5 percent and unemployment was at 6 percent. However, compared to the third quarter of 2007, the New Orleans Metropolitan area experienced a net gain of 2.3 percent in new jobs added. For instance, while construction jobs in the U.S. lost 5.9 percent, construction jobs in the New Orleans area gained 6.2 percent, mostly in infrastructure improvement projects (UNO 2008a, UNO 2008b).

- Housing affordability remains a challenge as fair market rents in the metro area continue to climb, increasing 46 percent since Katrina. While rent increases have slowed in the past two years, rents remain high. In 2008, a two-bedroom apartment in the region rents for an average of $990, up from $676 in 2005. Construction workers are included in the list of occupations where 30 percent of the gross monthly income would not be sufficient to meet the average rentals for an efficiency, one-bedroom, or two-bedroom apartment (GNOCDC 2008a, GNOCDC 2008c).

The most recent Greater New Orleans Multi-Family Report indicates that garden apartments in the Orleans–Algiers and East New Orleans areas average $728 with an 83 percent occupancy rate (Schedler 2009). These data include a mix of studio units to three-bedroom/two-bath units. The fall 2008 Report indicated that an additional 1,528 units would be added to the existing inventory in 2009 (Schedler 2008). With respect to the project area, the closest apartment units in major renovation are the Lake Terrace Gardens (183 units in Orleans Parish), and Hidden Lake (461 units in New Orleans East (Schedler 2008).


**Figure 40. Planning Districts in the Project Vicinity**

The IHNC divides the project area into two planning districts, Gentilly Planning District 6 to the west and New Orleans East Planning District 9 to the east (figure 40). The Gentilly area is also known as Pontilly by the City of New Orleans City Planning Commission Neighborhoods Rebuilding Plan (CNO 2006a). Within these two planning districts, the INHC separates two neighborhoods at the project area, Pontchartrain Park to the west and Pines Village to the east (figure 41). Both neighborhoods are described below to provide the basis for understanding and assessing potential impacts.


**Figure 41. Primary Land Uses Adjacent to Project Area (Facing South)**

### Pontchartrain Park Neighborhood

Information on the Pontchartrain Park neighborhood was collected from sources such as the Pontchartrain Park Neighborhood Association (PPNA) and the Pontilly Neighborhood Association (PPNA 2008; Pontilly 2008), the Gentilly Civic Improvement Association (GCIA 2008), the GNOCDC (GNOCDC 2008a), and the City of New Orleans City Planning Commission Neighborhoods Rebuilding Plan (CNO 2006a). The following neighborhood description is compiled from those and other data sources as noted.

Pontchartrain Park is a suburban neighborhood developed in the 1950s. It is within Census Tract 17.01, ZIP Code 70126, Township 12 South/Range 11/ Section 11. It is one of the first areas in New Orleans designed to provide home ownership to middle and upper income African Americans and one of the last Gentilly neighborhoods to be developed. Two major streets run through the neighborhood from Chef Menteur Highway, Press and Congress Drives. All other streets are curvilinear and prevent passage out of the neighborhood, creating a degree of privacy and pedestrian safety. The neighborhood has access to public transit as served by the New Orleans Regional Transportation Authority (RTA).

The neighborhood is at the eastern terminus of a bike corridor and sports route (cycling) that extends along 6.5 miles along Lakeshore Drive from the IHNC to West End. This segment is not part of the Mississippi River Trail (a multi-state bike route) (Regional Planning Commission [RPC]) 2006). The neighborhood has several active civic organizations such as the Pontilly Neighborhood Association and Pontchartrain Park Home Improvement Association.

Geographically, the neighborhood sits in a *polder*, a low-lying tract of land enclosed by embankments. The IHNC is at a higher base elevation than the adjacent Pontchartrain Park neighborhood.

Approximately 30 homes in the Pontchartrain Park neighborhood back up to the existing HSDRRS on the west bank of the IHNC, with distances ranging from approximately 50 ft to 80 ft from the levee to the rear of individual houses. The height of the levee wall is generally well-above the existing rooftops of the houses which are primarily one-story (photo 6).


**Photo 6. Proximity of Pontchartrain Park Homes to the Existing Levee**

Photo 7 captures the view of the levee wall from a neighborhood road, in the approximate location of the alternative #3 alignment. The building in the background is a facility at the RV park.

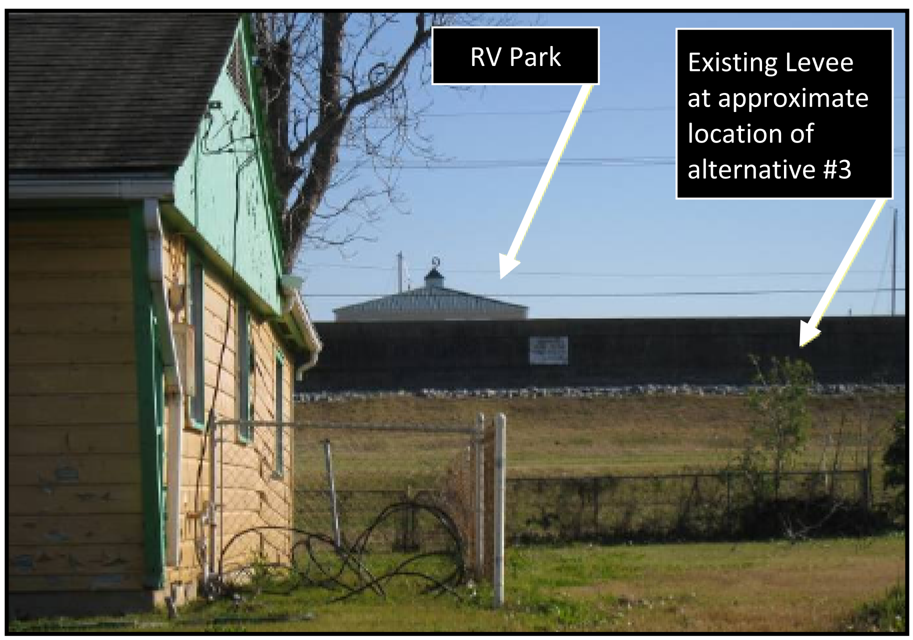



**Photo 7. View of Existing Levee from Pontchartrain Park**

As discussed in section 3.2.10, the Pontchartrain Park neighborhood contains a notable resource, the Joe M. Bartholomew Sr. Municipal Golf Course. During the segregation era in New Orleans, this golf course was the only course available to African-Americans. Although not currently listed on the National Register of Historic Places, neighborhood and civic organizations are pursuing such designation (GNOCDC 2008a). As part of its compliance responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended, to identify and evaluate historic properties, FEMA conducted an historic properties identification and evaluation survey after

Hurricanes Katrina and Rita. FEMA, in consultation with the Louisiana SHPO, has identified the Pontchartrain Park National Register Historic District, which incorporates Pontchartrain Park and portions of streets on the east side of the park including Prentiss Avenue, Congress Drive, Madrid Street, DeBore Drive, Morrison Road, and Frankfort Street, as eligible for listing in the National Register of Historic Places (FEMA 2006).

The Pontchartrain Park neighborhood is within the New Orleans Redevelopment Authority (NORA) jurisdiction, District 6 (Gentilly). NORA is assisting in various ways with the post-Katrina recovery efforts in Pontchartrain Park and other areas. Organizations such as The Road Home have helped to purchase properties to prepare them for redevelopment. Redevelopment plans include organizations such as Ponchartrain Park Community Development LLC, with plans to construct 25 affordable, wood-homes around the golf course (WDSU 2008).

Portions of the neighborhood are within an Economic Development/Enterprise Zone. This state-administered program provides tax credits and refunds to businesses locating or expanding in designated enterprise zone areas. Within the project area, the following Census Block Group is included within an Economic Development/Enterprise Zone (RPC 2007): 17.01 2 (Pontchartrain Park area to Dreaux Avenue).

Within the broader Gentilly area, approximately 80 percent of residents indicated an intent to come back (UNO 2006). Current data from the GNOCDC indicate a 53 percent rate of return in the Gentilly Planning District 6 (which includes Pontchartrain Park). The current population estimate for District 6 (June 2008) is 10,355 (GNOCDC 2008b). As of March 2008, Planning District 6 has the third largest number of unoccupied addresses at more than 8,000 or 44 percent of all addresses in that planning district (GNOCDC 2008b).

Residents have expressed a desire to rebuild their community in the same fashion for the residential construction as it was before Hurricane Katrina, characterized by single family homes (CNO 2006a).

To establish a baseline of community conditions, pre-Katrina data are presented. While this is not necessarily reflective of current conditions, it establishes a baseline which defines the community that may rebuild. These data are from the City of New Orleans for the broader Pontilly neighborhood (of which Pontchartrain Park is one of 20 neighborhoods) (CNO 2006a):

- Population in 2000: 7,017;
- Mean household income in 2000: $42,917;
- Owner-Occupied housing in 2000: 82.2 percent.

Five projects are identified within the Pontchartrain Park neighborhood for redevelopment (CNO 2006a):

- Renovate and re-open the Pontchartrain Park Senior Community Center,
- Restore Pontchartrain Park, Bartholomew Golf Course, and Barrow Stadium,
- Create a pedestrian/bike path around Pontchartrain Park,
- Renovate and reopen the Coghill Elementary School,
- Enclose Dreaux Canal and create a walking path.

Current land use zoning within the Pontchartrain Park neighborhood is single-family residential to the west of France Road, and Heavy Industrial between France Road and the IHNC. Future land use in this area is being defined by the Master Plan and Comprehensive Planning Ordinance Process. The City Planning Commission conducted a public meeting within Planning District 6 on 11 November 2008. The following long-term key projects and initiatives were presented for Planning District 6 and the Pontchartrain Park neighborhood (CNO 2008b):

- Create a long-term framework for transformation of the Industrial Canal into a waterfront incorporating mixed-use development, boating, parkland, and neighborhood access.
- Restore Pontchartrain Park as the District's signature public space.

Current real estate or property values are estimated at $106,000 in Pontchartrain Park, up from about $50,000 in January 2008. The average for New Orleans area is $143,000 as of January 2009 (Zillow 2009).

**Pines Village Neighborhood**

Information on the Pines Villages neighborhood was collected from sources such as the GNOCDC (GNOCDC 2008a), and the City of New Orleans City Planning Commission Neighborhoods Rebuilding Plan (CNO 2006b). The following neighborhood description is compiled from those and other data sources as noted.

The Pines Village Neighborhood is located at the far western edge of Planning District Nine. It is within Census Tract 17.20, ZIP Code 70126, Township 12 South/Range 12/Section 6. Pines Village is generally bordered by the IHNC on the west, I-10 to the east and south, and Morrison Road to the north.

In the 1950s, the neighborhood's namesake, Sigmund Pines, purchased a large piece of marsh land adjacent to the Industrial Canal and proceeded to develop it with residences. In the 1950s and early 1960s, substantial numbers of dwellings, both doubles and single-family detached, were built in the Pines Village Subdivision. Pines Village is one of five neighborhood areas in Planning District 9. The Pines Village neighborhood was one of the first to be developed in New Orleans East.

With construction of the Industrial Canal, completed in 1923, the Pines Village and other neighborhoods to the east were separated from New Orleans neighborhoods to the west. New Orleans East became isolated because of limited transportation crossings.

Approximately 67 acres of industrial/commercial use property are located between the IHNC and the residential areas of Pines Village, whereas residential areas in Pontchartrain Park abut the existing HSDRRS and are separated from the IHNC by a narrower industrial buffer (approximately 39 acres). The residential areas in Pines Village are located approximately a quarter of a mile east of the edge of the project site. The residential areas in Pontchartrain Park are located as close as 50 ft to 60 ft from the edge of the project site.

The street patterns for the Pines Village neighborhood reflect an interconnected street and grid system. There are a few select locations in which the street grid dead ends. The neighborhood is primarily accessed through Downman Road. Additional entrances on Chef Menteur Highway are most readily accessible if traveling west on Chef Menteur Highway. The neighborhood has access to public transit as served by the New Orleans Regional Transit Authority. The neighborhood does not include identified city-wide bike corridors (RPC 2006).

As with Pontchartrain Park, the Pines Village neighborhood sits in a *polder*. The IHNC is at a higher base elevation than the adjacent neighborhoods. Pines Village contains one neighborhood park, several churches, two schools and commercial/industrial development. There is only one notable neighborhood playground in the Pines Village neighborhood. Digby Playground, approximately 0.85 miles from the boundary of the project site (figure 37), is the home to one of the New Orleans Recreation Departments youth programs. The 1.91-acre site contains playground equipment, a basketball court and baseball field. There are also open spaces that are part of the apartment complexes. There are no local, state, or Federal Historic Districts designated in the neighborhood.

The Pines Village neighborhood is not within the NORA jurisdiction. The industrial portions of the neighborhood are, however, within an Economic Development/Enterprise Zone. This state-administered program provides tax credits and sales and use tax refunds to businesses locating or expanding in designated enterprise zone areas. The following Census Block Group is included within an Economic Development/Enterprise Zone (RPC 2007): 17.20 4 (Lakeshore Drive to Downman Road to Dwyer Road to Stemway Drive to Chef Menteur Highway.

Redevelopment goals of the neighborhood include improving residential conditions. Current zoning has allowed for mass concentration of subsidized housing in single development sites. It has been clearly expressed that there is no opposition to affordable or subsidized housing but there is opposition to high density concentrations at such sites. Current density regulations would be capped to a maximum of sixteen units/gross acre (CNO 2006b).

The vision of the Neighborhood Recovery Plan is to restore the quality of life in Pines Village to the level that existed prior to Hurricane Katrina plus make key improvements to the quality of life in the neighborhood, seeking a clear delineation between the industrial and residential areas. The Pines Village neighborhood is comprised of a mixture of single family detached, doubles, and multi-family homes and apartment complexes. It is the desire of the neighborhood to maintain and enhance the structure of the single family detached residential neighborhoods and encourage the multi-family complexes to rebuild under the proposed RM-2E District. Current data from the GNOCDC indicate a 49 percent rate of return in the New Orleans East Planning District 9 (which includes Pines Village) and a 49 percent rate of unoccupied residences. The current population estimate for District 9 (June 2008) is 15,866 (GNOCDC 2008b). As of March 2008, Planning District 9 has by far the largest number of unoccupied addresses at more than 14,000 or 49 percent of all addresses in that planning district (GNOCDC 2008b).

To establish a baseline of community conditions, pre-Katrina data are presented. While this is not necessarily reflective of current conditions, it establishes a baseline which defines the community that may rebuild. These data are from the City of New Orleans (CNO 2006b):

- Population in 2000: 5,092;
- Mean household income in 2000: $43,386;
- Owner-Occupied housing in 2000: 63.5 percent.

The following summarizes redevelopment projects as identified by the City of New Orleans for the Pines Village neighborhood (CNO 2006b):

- Street repairs (Downman Road),
- Replace street trees,
- Repair signage and signals,
- Dwyer Road drainage improvements,
- Digby Park improvements,
- Develop new school and community center at Ray Abrams Elementary,
- Bus shelters on Dwyer and Downman Roads.

Current land use zoning within the Pines Village neighborhood includes:

- Heavy Industrial,
- Light Industrial,
- Single-Family Residential,
- Two-Family Residential,
- Multiple-Family Residential,
- General Commerce.

Future land use in this area is being defined by the Master Plan and Comprehensive Planning Ordinance Process. The City Planning Commission conducted a planning meeting within Planning Districts 9, 10, and 11 on 12 November 2008. The following long-term key projects and initiatives were presented for Planning District 6 and the Pines Village Neighborhood with respect to the project area:

- Maintain the Industrial Canal Employment/Industrial Development Zone,
- Enhance buffer area between industrial and residential areas along Downman Road,
- Extend Dwyer Road into the Industrial zone with a buffer area,
- Expand low-density residential infill areas north of Morrison Road with ground-level parking.

Current real estate/property values are estimated at $72,000 in Pines Village, up from about $50,000 in January 2008. The average for New Orleans area is $143,000 as of January 2009 (Zillow 2009).

**Industrial and Commercial Resources**

The banks of the IHNC provide land for industrial uses. The east bank is more heavily dominated by active industrial uses. The west bank has more vacant land. Some industrial resources decided not to return after Hurricane Katrina and the closure of the MRGO at Bayou La Loutre (DeGregorio 2008). However, several industrial and commercial resources remain within the project area or vicinity.

The western bank of the IHNC is characterized by approximately 48 acres of industrial property between the IHNC and France Road with residential homes backing up to the existing levee west of France Road. Most of the industrial lands on the western side of the IHNC are vacant or cleared. Among the industrial users on the west bank is a relatively new addition that may be indicative of future land use change on this side of the IHNC: an RV park. The eastern bank of the IHNC is characterized by approximately 25 acres of industrial property between the IHNC and Jourdan Road with approximately 100 acres of additional industrial use from the existing levee to residential homes east of Seabrook Place.

Industrial and commercial resources identified within the project vicinity or known to use the project vicinity are listed below in table 14 and shown in figure 42.

**Table 14.**
**Facilities on the IHNC in the Project Vicinity**

| Facility | In Project Area? | Intermodal Transport Requirements | | | |
|---|---|---|---|---|---|
| | | Boat/Barge | | Rail | Truck |
| | | IHNC to Lake Pontchartrain | IHNC to GIWW | | |
| **Shavers – Whittle Yard** | Yes | | X | | |
| **Cat5 Composites** | Yes | X | X | | X |
| **RV park** | Yes | X | | | |
| **Seabrook Marine** | No | X | X | | |
| **Orleans Materials** | No | | X | X | X |
| **Holcim Cement** | No | | X | X | X |
| **Trinity Yachts** | No | X | X | X | |
| **US Gypsum** | No | | X | X | X |
| **Port Maintenance Facility** | Yes | | X | X | X |
| **Morrison Wharf/Turning Basin** | Yes | X | X | X | X |
| **Halliburton** | Yes | | X | X | X |
| **Trinity (Madisonville)** | No | X | X | | |
| **USCG** | No | X | X | | |


**Figure 42. Industrial Commercial Resources along IHNC**

The following is a discussion of industrial users along the IHNC beginning on the west bank at the northern portion of the project area. Industrial and commercial resources within the project area are discussed first, followed by industrial and commercial users outside of the project area. Interviews were conducted with representatives of each business to collect basic operational information as well as to receive their feedback on the different alternatives.

**Port of New Orleans** – The open water of the IHNC and adjacent land is owned by the Port of New Orleans. Parcels are leased to tenants who may need water access for their operations.

**Shavers-Whittle Construction Material Yard (former)** – The property at 6401 France Road is approximately 144,000 square ft and is owned by the Port of New Orleans. It extends into the IHNC along Slip Number 6. The current lease has expired. The Port plans to use the property as a laydown yard for a period of about 4 months to 6 months starting in the spring of 2010 to construct a new dredge assembly.

**Cat 5 Composites** – Cat5, located on 3.2 acres at 6201 France Road, holds various government contracts for ship repairs. The current lease with the Port of New Orleans has expired. The business would likely remain, but under sub-lease to Pontchartrain Landing when they expand their holdings to the north. Cat5 Composites has plans to add docks and ramps to facilitate their sea trials. Currently, Cat5 uses both Lake Pontchartrain and the GIWW for sea trials. Speed runs are conducted in the GIWW. When conducting sea trials in the lake, they rely on access to the lake through Seabrook.

**Pontchartrain Landing Waterfront RV Park** – The property at 6001 and 6101 France Road is an approximately 20-acre RV park owned by the Port of New Orleans and leased to Pontchartrain Properties. The site fronts the IHNC approximately 2,500 ft south of Lake Pontchartrain and borders Slip No. 5 with the Seabrook Marina. The park's capacity is 152 RV parking slips (105 currently available) in various price ranges from \$38 to \$125 per day or \$700 to \$1400 per month. Tenants often bring their boats and can pay to use the on-site public launch for quick access to the lake and the popular fishing spot (deep scour hole) immediately north of the proposed gate. On a busy weekend, the ramp handles as many as 100 launches a day with boats ranging from 30 ft to 130 ft. Tenants frequent the park for various recreational uses including fishing in Lake Pontchartrain at Seabrook. The RV park site plan illustrates that the facility either currently provides, or plans to provide: boat launches, boat trailer parking, houseboat parking, houseboat rentals, and RV storage. Currently, the RV park provides quick access to the lake and the popular fishing location immediately north of the proposed Seabrook gate (the existing deep scour hole). The distance from the RV park to this location is about one mile at present and customers of the Park can easily launch for a day trip and make frequent returns as needed to the Park for bait, supplies, or restroom facilities. The RV park provides services supportive of recreational uses, consistent with long-range plans for the west bank of the IHNC. Vehicle access is provided from France Road. Pontchartrain Landing identifies itself as the newest and largest waterfront RV park in New Orleans. The RV park states it has long-term plans to expand their operations north along the IHNC to include mixed-use facilities. Financing for this phase has not been secured as of the present time.

**Morrison Yard Wharf and Turning Basin** – Owned by the Port of New Orleans, and located in the 7300 block of Jourdan Road, this site houses pile driving equipment and is used for top-side repair of Port vessels. Fender piles are stored on the east side of the Turning Basin. They are delivered by rail and loaded on vessels for installation along their various wharfs. The wharf structure is leased for lay-berthing third-party vessels and on occasion for cargo unloading. The large warehouse was leased for storage pre-Hurricane Katrina. The approximately 8-acre Turning Basin is used by the Port, Halliburton, and Trinity Yachts. Industrial resources along the IHNC also recognize that the Turning Basin is used as a temporary safe haven for boats to stop overnight or as conditions on the lake warrant need for temporary shelter.

**Halliburton/Baroid Drilling Fluids Inc./Dresser Industries –** For approximately 50 years, Halliburton has performed grinding operations at their plant on the IHNC, immediately south of the Seabrook bridge on the eastern bank off Jourdan Road. The facility grinds barite and bentonite for use in drilling muds for petroleum drilling operations. This processing plant is located at 8000 Jourdan Road on 12.19 acres owned by the Port of New Orleans and leased to Halliburton Energy Services currently through 2011.

Materials for grinding/crushing operations are barged in from the Mississippi River on the GIWW, not through Seabrook. Raw materials (barite from China and bentonite from Wyoming) are received on large ships two to three times per year. The material is off-loaded onto 120-foot barges for transport up the IHNC through the GIWW to the plant. Material is off-loaded at the northern portion of the Morrison Wharf facility in the Turning Basin, or along the eastern side of the IHNC. Their scales are on the eastern side of the IHNC, immediately north of the Turning Basin. About 30 barges are required to off-load the contents of a single ship. Halliburton had previously utilized MRGO but now relies on the GIWW for these shipments. They do not rely on access to the lake under the Seabrook Bridge for any materials movement (imports or exports). They utilize rail, truck, and water for materials transport. They have a rail spur that enters their facility from the line that runs north/south along the eastern shore of the IHNC.

The plant employs 12 full-time equivalents (FTE). Operations are generally during the daytime, but they occasionally will operate in various shifts depending on production schedules/needs. Operations may occasionally produce airborne dust; however, the dust is not toxic/hazardous and would not result in a risk to construction workers working on the Seabrook gate project. The facility operates under permit from the LaDEQ. The plant also employs six contract employees two times to three times per year when unloading ships for their stockpile.

The site is within a 10-year Foreign Trade Zone Operating Agreement (New Orleans City Business 2007). This designation exempts the facility from customs duty payments on imported barite used in export production. Less than 1 percent of production is exported. The facility also recognizes benefits on elimination of duties on materials that become scrap/waste during manufacturing (Federal Register [FR] 73 2008).

**New Orleans Public Belt Railroad -** New Orleans Public Belt Railroad operates both rails running north/south along the east and west banks of the IHNC. Their lines do not join with the Norfolk Southern line that spans the IHNC at Seabrook. Of the industries shown in figure 42, New Orleans Public Belt provides rail service to:

- Halliburton/Baroid/Dresser,
- US Gypsum,
- Orleans Materials,
- Holcim Cement, and
- Trinity Yachts.

Current operations are generally at night or early morning, about three times a week, with approximately 10 to 12 rail cars, based on needs. The existing rail lines on the west side of the IHNC terminate approximately 3,500 ft from the northern-most endpoint of the line.

## Users of the IHNC Outside the Project Area

The following discussion, with information provided by the facilities, focuses on industrial and/or commercial facilities that utilize the IHNC to access Lake Pontchartrain or the GIWW, but are not located within the project area. The following facilities are outside of the project area (shown in figure 42) but could be affected by the Tier 2 Pontchartrain project:

- Seabrook Marine;
- Orleans Materials;
- Holcim Cement;
- Trinity Yachts;
- US Gypsum; and
- Trinity Marine Products.

This list may not be all-inclusive, but represents the known IHNC (Seabrook area) users. Additional users may be further identified through the public comment process.

**Seabrook Harbor/Seabrook Marine, LLC** – Located at 5801 France Road, this 7.81 acre facility provides services to refurbish and repair boats, including dockage and dry storage. Additional facilities include a store, showers, fuel, bait sales, and fish cleaning facilities. Dry storage is available for up to 200 vessels in a stacked configuration in a warehouse. There are eight in-water slips with 250 ft dockage. Approximately 80 spaces are available for storage for boats up to 80 ft.

The property is owned by the Port of New Orleans and leased to Seabrook Harbor LLC which is operated by a local family. The current lease extends through 2018. The facility has been in operation since 1993 and is open seven days a week except for primary holidays. Approximately 40 people are employed by Seabrook. Their workers typically come from New Orleans East and are typically Vietnamese fishermen who are skilled in boat repairs.

The location of Seabrook Marine on the IHNC is important to their customer base for quick access (less than 0.5 miles) to Lake Pontchartrain. Seabrook Marine depends on this location to readily serve recreational fishermen on Lake Pontchartrain. For example, they sell bait for the popular fishing locations in the lake on the northern side of the IHNC. On a typical weekend day, they will sell 20,000 shrimp at $0.30 each, and launch as many as 65 boats per weekend day.

In addition, Seabrook Marine processes 400 boats to 500 boats per year for repairs. Maintenance can be as quick as 4 days to 5 days for hull cleaning (removal of marine growth, etc.), to 3 months to 4 months for a refit.

Seabrook Marine states it has invested over $10M over the past 15 years in equipment and improvements at this location, including over $1M in repairs following Hurricane Katrina not financed by FEMA or insurance.

**Trinity Yachts, Inc**. – Located at 4325 France Road, Trinity Yachts is a builder of custom yachts of steel and aluminum construction for vessels up to 160 ft and 300 tons. These crafts typically have a draft of 8 ft to 10 ft as most are not displacement hulls. The France Road yard does not have launch capacity for larger sizes. Larger yachts (up to 300 ft) are constructed at their Gulfport facility. The France Road yard constructs modules for shipment to the Gulfport yard for larger vessels. The France Road yard receives construction materials on barges. Delivery of completed yachts is made through the GIWW. The France Yard operation employs about 250 workers (fitters, welders, carpenters, painters, etc). They were in a hiring mode as of mid-2009.

The France Road facility conducts sea trials on their vessels prior to delivery to the customer. They previously used both the MRGO and the IHNC. With the closure of the MRGO, they now rely on the IHNC for access to Lake Pontchartrain. At any given time, they typically have about five yachts in their production process. Approximately every 90 days, a yacht comes off the production line. They run sea trials about four times a year.

**Trinity Marine Products** – Located at 150 Highway 21 in Madisonville, Louisiana, Trinity Marine Products Inland Barge Group operates a shipyard on the north shore of Lake Pontchartrain. They are the largest manufacturer of barges used to transport cargo on U.S. inland waterways. Trinity Marine manufactures tank barges that carry petroleum, petroleum products, fertilizer, ethanol, chemicals, and other liquid cargo.

The Madisonville yard receives about 16 barges per year with incoming steel shipments. Barge sizes are generally about 200 ft by 35 ft by 12 ft. Loaded with steel, the barges require about 9 ft draft. They receive steel from Mobile, Alabama using the GIWW. Some steel components also arrive on truck. The Madisonville yard produces about 32 barges per year with an approximate size of 300 ft by 54 ft by 12 ft. On average, they turn out a completed product every 3 months with about seven barges in the production pipeline at any given time. The Madisonville yard employs about 300 FTE.

A completed empty barge for customer delivery requires about 3 ft draft. They have typically used the Seabrook pass at the IHNC for delivery from the north shore to the GIWW. However, delivery through the Rigolets would be a possibility. Approximate distance from their yard to the GIWW through the Rigolets is 50 miles. Approximate distance from their yard to the same point on the GIWW through Seabrook is about 60 miles. Although a slightly longer distance, the Seabrook pass is a more favorable navigational route for their barges.

**Holcim Cement –** Holcim Cement is a distributor of cement products. The facility at 5301 France Road facility employs 7 FTE. Operations can occur at this facility 7 days a week, 24 hours a day. Their product is made in Theodore, Alabama and received at this location via barge from the GIWW and rail. Holcim does not rely on the Seabrook pass between the IHNC into Lake Pontchartrain; however, the long delivery barges (340 ft) might require the functionality of the Turning Basin. Product is distributed from this facility by way of rail and truck. The plant would require France Road and the rail lines to remain functional. Their facility was damaged during Hurricane Katrina but recovered using private money within approximately one year.

**Orleans Materials** – The France Road yard of Orleans Materials fabricates various materials from steel. Currently, the yard is producing 60-ft deck barges. Within a period of 18 months recently, they produced six barges. Twenty-five FTE are employed at this location. The yard receives steel by both barge and rail. Barge traffic does not rely on the Seabrook pass; shipments are received through the GIWW. Following Hurricane Katrina, self-funded recovery of this facility took about 18 months.

**US Gypsum –** US Gypsum previously produced both wallboard and mineral wool ceiling tile such as SHEETROCK® brand gypsum panels and DUROCK® brand cement board. Sheetrock production was suspended in December 2007 but the plant still produces cement board. Approximately 60 FTE are currently employed, down from 160 at peak production.

US Gypsum utilizes the GIWW for shipments to their plant. They also receive trucked shipments of cement from the Holcim plant on the west bank of the IHNC and rely on rail operations of New Orleans Public Belt Railroad to send out their finished product. The plant does not utilize the IHNC for access to Lake Pontchartrain.

## Navigational Resources

Navigational resources in the project area are associated with the IHNC and the associated slips in the project vicinity. The IHNC was completed in 1923 to provide navigation between the Mississippi River and Lake Pontchartrain, a distance of approximately 5 miles. The channel where the IHNC connects to Lake Pontchartrain is maintained at an elevation of -16 ft.

### *Inner Harbor Navigation Canal (IHNC)*

The IHNC within the project area consists of approximately 30 acres of open water (including the slips and Turning Basin). The channel is approximately 95 ft wide at its most narrow point and serves as an active navigation route for the Port of New Orleans and other vessels.

The IHNC lock connects the Lower Mississippi River to the IHNC and other sea-level waterways. The IHNC Lock is the only lock that provides access to the eastern segment of the GIWW. Shallow draft traffic that uses the IHNC Lock is predominantly made up of transits with origins and destinations beyond the local area. Shallow draft traffic forecasts developed for the 2005 Investigative Study showed a 0.8 percent annual compound growth rate in IHNC Lock traffic for the period 2002 – 2055 (USACE 2008d). The IHNC Lock is an obstacle for most of the deep-draft ships using the Mississippi River and the IHNC.

Actual tonnage of commodities passing through the IHNC Lock for 2007 was 17.4 million tons, lower than the forecasted tonnage of 18.8 million tons (USACE 2008d). Traffic records from the Waterborne Commerce Statistics Center (WCSC) show 17,228 thousand short tons of cargo passed through the IHNC in 2006 (WCSC 2006). The IHNC EIS reports that 17,253 thousand short tons of cargo passed through the IHNC in 2002. The traffic projection for 2015 is 22,625 thousand short tons of cargo (USACE 2008d).

In addition to barge and deep-draft vessel traffic, the IHNC Lock also serves recreational and other commercial vessels (such as fishing vessels), U.S. Government vessels, and local law enforcement vessels (USACE 2008d).

Depths in the IHNC within and around the project vicinity range from 30 ft to 41 ft, except for the scour hole located in the northern part of the IHNC, south of the railroad bridge.

The Seabrook Railroad Bridge provides a maximum horizontal clearance of 91.77 ft. Operations are monitored on Marine Channel 16. The Port of New Orleans has a storm operations plan that specifies that operations of the bridge cease with the bridge locked and fully lowered if winds exceed 40 mph (Port of New Orleans 2008).

The Seabrook Bridge is a medium-rise twin bascule, four-lane roadway bridge carrying Lakeshore Drive, connecting Leon C. Simon Drive on the upper side of the bridge with Hayne Boulevard on the lower side. The bridge is operated by the Orleans Levee District. It normally stays in the down position for vehicular traffic but provides sufficient clearance for most marine traffic. The vehicular bridges operate under Federal regulation 33 CFR 117.458 which requires the draw bridge to open on signal; except that, from 7 a.m. to 8:30 a.m., and 5 p.m. to 6:30 p.m. Monday through Friday, the draw need not be opened (Port of New Orleans 2008). The navigational pass under this bridge is referred to as the Seabrook pass in this document.

In addition to the specific navigational needs as discussed previously, the CEMVN, in discussions with the Gulf Intracoastal Canal Association, Trinity Marine (in Madisonville), and McDonough Marine estimate that the maximum design vessel utilizing the Seabrook Pass would be 700 ft long, 74 ft wide, with a draft of 12 ft. The 700-foot length is estimated from two 300-foot barges in addition to a 90-foot tug. As verified by the CEMVN in consultation with the

Norfolk Southern rail bridge tender, many barges that utilize the Seabrook pass are a two-barge configuration. No vessels having more than two barges have passed through Seabrook. The average number of barges passing through per month is 12 to 15.

Discussion of Impacts

Each of the alternatives would result in impacts to residential, industrial, and/or commercial resources along the IHNC. These impacts are discussed in detail below.

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

*Direct Impacts to Socioeconomics*

Residential

The proposed action would temporarily affect the residential area of Pontchartrain Park, particularly those residences along Pauline Drive. The proposed action floodwalls would tie into the existing levee immediately adjacent to the houses on the east side of this street. Impacts to the residential areas during the construction would be limited to noise which is further discussed in section 3.2.14 of this IER. Noise would be regulated in accordance with the City of New Orleans Ordinance 23263, Chapter 66, Article IV. There would be no direct impacts to residential neighborhood following completion of the proposed action.

U.S. Coast Guard

To help assess potential impacts to the USCG, an interview was conducted with the Commander, Eighth District, the USCG, and others. The USCG has two primary concerns with respect to this project: (1) emergency readiness and response time; and (2) hazard to navigation. The USCG frequently utilizes the Seabrook pass (estimated 450 to over 500 times over six months). Construction of any of the four alignments on the south side of the Seabrook Bridge would require the USCG to stage a vessel both north and south of the project site during construction to be able to respond to any emergent situation without having to make the detour through the Rigolets, a 2-3 hour trip (figure 44).

This would require the USCG to double their staff and asset deployment requirements for the duration of the construction period, at least for the period during which the cofferdam is in place (approximately 6 months to 12 months). A new mooring site would need to be obtained and prepared south of the project site as no such site currently exists. The USCG would need to seek budget allocation to provide for this unplanned expense.

Following construction, the USCG would not experience any adverse impacts. The USCG would need to plan accordingly to be prepared for emergency response before and after hurricane conditions coordinating placement of their vessels with gate closure schedules.

Port of New Orleans

To help assess potential impacts to the Port of New Orleans, an interview was conducted with the Director of Business Development and the Real Estate Coordinator from the Port of New Orleans. During construction of the proposed action, the former Shavers-Whittle Yard (Port property) would be used as the laydown/construction area. The Port could lose the financial benefits of this property during its use as a construction yard. In addition, the Port has plans to use this parcel for approximately 4 months to 6 months beginning in spring 2010 to build a dredge barge. Depending on the timing, this could possibly overlap with the Seabrook floodgate construction timeframe, or the Port would need to find an alternate location or work in cooperation with the USACE for joint use of this parcel. The proposed action's new permanent easement on the Shavers-Whittle Yard (figure 5) would reduce the amount of land available for future use or lease by the Port.

New Orleans Public Belt Railroad

The proposed action would not adversely affect their rail operations following completion of construction. To aid the evaluation of impacts to this operation, an interview was conducted with the Chief and Assistant Chief Engineers of New Orleans Public Belt Railroad. During construction, the proposed action would not adversely affect their rail operations. The existing rail lines have not been rebuilt to the northern extent of the project site. Therefore, should the USACE wish to use rail delivery for any construction supplies or equipment during construction of the proposed action, NOLA Public Belt Railroad has the option to rebuild the rail line, given approximately 6 months lead time.

Cat5 Composites

To help assess potential impacts to this operation, an interview was conducted with the Vice President for Engineering, and the President of Cat5 Composites. Under the proposed action during construction, Cat5 would experience impacts associated with the restriction of navigational access to the lake via the IHNC and construction dust caused by an increase in construction vehicles on France Road. As their facility is not equipped with filtration, the vehicular traffic associated with the proposed action could result in dust contamination on their coatings; however, overall direct impacts to Cat5 would not be detrimental following completion of the proposed action.

Halliburton/Baroid/Dresser

To help assess potential impacts to this operation, an interview was conducted with the regional Location Manager with follow-up discussion with the on-site plant manager. During and following construction, the proposed action could result in operational changes such as relocating loading/unloading operations from the east bank of the IHNC into the Turning Basin. The distance between the proposed Seabrook floodgate structure under the proposed action and the east bank of the IHNC may not be sufficient to allow unloading on the IHNC bank on the north end of the facility's lease. Halliburton currently does not hold a lease on the dock in the Turning Basin, although at least one of their vendors obtains approval on a ship-by-ship basis to unload in the Turning Basin. Under the proposed action following construction, Halliburton would need to negotiate a lease with the Port for access and use of the Turning Basin. Otherwise, incoming ore would need to be trucked from an alternate unloading site (not yet identified).

A portion of the Halliburton property would be required as permanent easement, however, very little of this property would be affected as construction would occur north of the existing plant infrastructure.

Holcim Cement

To help assess potential impacts to this operation, an interview was conducted with the site manager of Holcim Cement. Holcim Cement would not experience any direct impacts from the construction of the proposed action.

Orleans Materials

To help assess potential impacts, an interview was conducted with the President of Orleans Materials. This facility would not experience any direct impacts, either during or after construction of the proposed action.

Lake Pontchartrain Properties (RV park)

To help assess potential impacts to this operation, an interview was conducted with the Managing Partner, Lake Pontchartrain Properties, LLC; the General Manager of the facility, and a General Contractor. This commercial resource would be impacted during the construction of the proposed action due to the restriction of navigation from the RV park to the lake. Alternative routes to the lake are available through the Rigolets and Chef Menteur Pass (figure 43). The Rigolets detour; however, requires an 11–hour round trip and is not a viable option for this resource's clientele (day-fishermen). The Chef Menteur Pass is considered by many boaters to be unreliable for navigation. If boats could be transported over land to an alternative launch site (e.g., Seabrook Launch), boaters could still enjoy close access to the fishing site, but would require additional coordination to arrange for drop-off and pick-up. Following the construction, the proposed action would have no direct impacts on the RV park.


**Figure 43. Alternative Navigation Routes (bypassing the project area)**

Seabrook Marine

Although not in the immediate project area, Seabrook Marine would be severely impacted under the proposed action during construction due to the disruption of navigation through the Seabrook pass. The majority of their clientele (boaters from Lake Pontchartrain) would no longer be able to readily access the goods and services available at Seabrook Marine. Boaters may use the alternative passage through the Rigolets as a detour with additional time requirements as described previously for the RV park. This alternate route has very shallow passes and height restrictions that would preclude many common taller boats that use Seabrook Marine. The same restrictions are true to an even greater extent through the Chef Menteur pass. Some boaters may still use the launch and services provided by Seabrook Marine and change their destination to accessible areas such as Lake Borgne.

According to Seabrook Marine, even following construction, the proposed action would have detrimental impacts on Seabrook Marine. Unlike the RV park, the loss of business following completion of the construction phase would not be readily reparable; impacts could be felt up to 3 years in rebuilding customer base. The reason for this is that much of the customer base is from the approximately 200 boats in dry storage. This accounts for approximately one-third of their operational revenue (whereas about two-thirds of their revenue is from repair of larger vessels). If these day-trip customers were not able to access the lake from this location during construction, they would likely relocate to another facility that would meet their needs for day-trip access to the lake and the popular fishing location. After relocating, they would be less likely to return. Based on industry standards, it is estimated it would take 2 years to 3 years to re-populate the 200 boats in dry storage (assuming there was sufficient demand from the area population). In addition, the proposed action may have long-term impacts on the local fishery (as discussed in sections 3.2.4 and 3.2.10), which may take years to recover from and in turn, could reduce the number of people fishing in the area and using Seabrook Marine.

Boats that are housed at Seabrook with their trailers could be towed a short distance over land to the public boat launch at Seabrook Boat Launch. This option provides boaters with easy access to nearby popular fishing sites in the lake. This option would require additional coordination to arrange for drop-off and pick-up. In addition, Seabrook clients could change their destinations to areas that will remain accessible during the construction such as Lake Borgne and the Golden Triangle.

Trinity Yachts

To help assess potential impacts to this operation, an interview was conducted with the Facility Engineer. Although not in the immediate project area, Trinity Yachts would be affected under the proposed action during construction. During construction, Trinity Yachts would experience operational impacts due to the closure of the IHNC leading to Lake Pontchartrain for approximately 6 months to 12 months. Trinity Yachts conducts sea trials on their vessels prior to delivery to the customer. They previously used both the MRGO and the IHNC. With the closure of the MRGO, they now rely on access to Lake Pontchartrain. At any given time, they typically have about five yachts in their production process. Approximately every 90 days, a yacht comes off the production line. They run sea trials about four times a year. Therefore, during construction of the proposed action, access to the lake would likely temporarily adversely affect four sea trials. Alternative sites for the sea trials may include Lake Borgne or the Gulf of Mexico. Following construction, Trinity Yachts would not experience further operational impacts.

Trinity Marine Products (Madisonville)

To help assess potential impacts to the Trinity Marine Products Inland Barge Group operation, an interview was conducted with the Vice President, Liquid Cargo Business Unit. During construction, Trinity Marine Products would experience moderate operational impacts and would need to re-route delivery of completed barges through the Rigolets. The Rigolets would be the preferred detour over the Chef Menteur Pass for navigating large barges. The approximate distance from their yard to the GIWW through the Rigolets is 50 miles. The approximate distance from their yard to the same point on the GIWW through Seabrook is about 60 miles. Although a slightly longer distance, the Seabrook pass is a more favorable navigational route for their barges. Following construction, operations would return to pre-construction conditions for Trinity Marine and no further impacts would be anticipated.

US Gypsum

To help assess potential impacts to this operation, an interview was conducted with the facility Engineering/Maintenance Manager. The plant does not utilize the IHNC for access to Lake Pontchartrain. The proposed Seabrook floodgate (any alternative) would not appear to have adverse effects on their facility or operations during construction or following construction.

*Indirect Impacts to Socioeconomics*

Local Economy

The local economy could see direct beneficial impacts in terms of use of local materials and human resources as well as an overall beneficial impact to the reconstruction efforts in New Orleans. However, due to a relatively tight labor market, there may not be adequate local human resources for the construction activities and some construction workers may need to be brought in from other areas. This could be beneficial for the local economy in terms of short-term housing. However, due to the current limited supply of short-term housing, it could also adversely affect residents looking for rental housing while recovery efforts are underway. Additional demand could drive up rental prices which are already high. Overall, however, the influx of additional construction workers would be expected to provide positive economic benefits to area support services such as food, lodging, and entertainment venues. It is expected that the local economy would benefit from having 100 year level flood damage risk reduction by encouraging redevelopment of and investment in the New Orleans area.

ROW Acquisition

Construction would require acquisition of new ROW. The proposed action would utilize the Shavers-Whittle property at 6401 France Road for the construction staging area for approximately 36 months. The proposed action would result in obtaining a total of approximately 26 acres of ROW including 14 acres for permanent easements and 12 acres for temporary easements. Acquisitions would be required from the Port of New Orleans (7.16 acres) and the Norfolk Railroad (3.47 acres). An easement (2.56 acres) would be required with the Port of New Orleans on the Shavers-Whittle property at 6401 France Road. A portion of the Halliburton property (8000 Jourdan Road) would be required as well, however, very little of this property would be affected as construction would occur north of the existing plant infrastructure.

Facility and Utility Relocations

Of all alternative actions, the proposed action would have the least impact on facilities and utilities. Properties would be affected at the Shavers-Whittle property, Halliburton property, including facilities/utilities owned by the state Department of Transportation, Entergy, and the Sewerage and Water Board of New Orleans.

*Cumulative Impacts to Socioeconomics*

The cumulative impacts to socioeconomics from the proposed action, the Borgne Barrier, and the MRGO closure structure at La Loutre include temporary and permanent closures of navigation routes. The Decision Record for the IER #11 Tier 2 Borgne document verifies that navigational access would remain open on the GIWW during that construction process. Navigation south of the Seabrook floodgate, therefore, would not be cut off from the GIWW due to provision of a barge gate (150 ft by 16 ft) at the GIWW approximately 1,150 ft east of the Michoud Canal. Under the proposed action, there would be a period of approximately 11 months where construction activities would be in process on the Seabrook gate and the gate at the GIWW. In the overlapping period, there would be approximately 6 months to 12 months where the access to Lake Pontchartrain is closed at Seabrook. During this time, navigational traffic would require diversion through the GIWW which would remain open to navigation. The cumulative effect of this impact would mean increased travel time for users who need to access Lake Pontchartrain from the IHNC and/or possible loss of business to commerce that provides a primarily recreational function during this time.

The various HSDRRS and CWPPRA projects throughout the project vicinity are expected to have both beneficial and detrimental cumulative impacts on recreational fishing. As described in more detail in section 3.2.4, beneficial impacts to the recreational fishery, and therefore, recreational fishing, including improving salinity and DO concentrations in some areas. Negative impacts include both temporary and permanent decreases in dispersion of recreational species and organisms they depend on. Detrimental cumulative impacts on the local fishery would be expected to decrease fishing opportunities during construction. Reduced transport of larval organisms from the Gulf into Lake Pontchartrain over the long term may result in slightly smaller populations of some sport fish and/or their prey, which may in turn reduce the effectiveness of fishing in the area. The reduction in this recreational activity may also have a detrimental economical impact on the industrial and commercial resources in the project area that service boat and bank fishermen during this time. It is expected that the local economy would benefit from having 100 year level flood damage risk reduction by encouraging redevelopment of and investment in the New Orleans area.

The proposed action would also have cumulative beneficial impacts to socioeconomic resources in the New Orleans metropolitan area. The cumulative effects of the referenced projects in the area could provide long-term and sustainable beneficial impacts to the communities within the study area by reducing the risk of damage within flood-prone areas and by generating economic growth. Economic growth could encourage repopulation within the New Orleans metropolitan area overall. Improved HSDRRS would benefit all residents, regardless of income or race, increase confidence, reduce insurance rates, and allow for development and redevelopment of existing urban areas.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

*Direct, Indirect, and Cumulative Impacts to Socioeconomics*

Direct, indirect, and cumulative impacts from alternative #2 would be similar to but greater than those described under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

*Direct Impacts to Socioeconomics*

Alternative #3 would result in more impacts both during and after construction than the proposed action. Overall, alternative #3 would offer no advantages either in terms of construction or post-construction. Following construction, alternative #3 would result in greater impacts due to functional loss of the Turning Basin, and would offer 100-year level of flood risk reduction to a fewer number of facilities than the proposed action.

Residential

In terms of impacts to the two adjacent neighborhoods, alternative #3 would result in generally the same impacts as discussed under the proposed action. The difference would be a slightly greater degree of potential for noise impact as alternative #3 has residential areas both northwest and southwest of the alignment (whereas the proposed action only has residential to the southwest). Noise would be regulated in accordance with the City of New Orleans Ordinance 23263, Chapter 66, Article IV regarding noise.

US Coast Guard

Impacts to the USCG associated with alternative #3 would be similar to those described for the proposed action.

Port of New Orleans

Under alternative #3, the port would experience impacts both during and after construction. The construction would obstruct functionality of the Turning Basin and the Morrison Wharf (figure 42). The port has a maintenance facility at the southern portion of the Turning Basin that would be obstructed both during and following construction. Under any of the alternatives, the former Shavers-Whittle Yard would be used as the laydown/construction area. While the port could benefit from a short-term lease of this property during its use as a construction yard, the port has plans to also use this parcel for approximately 4 months to 6 months beginning in spring 2010 to build a dredge facility. As this may overlap with the construction of the Seabrook floodgate beginning in spring 2010, the port may need to find an alternate location or work in cooperation with the USACE for joint use of this parcel.

New Orleans Public Belt Railroad

During construction, alternative #3 would result in service interruptions to relocate track and construct rail gates. Approximately 610 ft of track would need to be relocated. Following completion of construction, operations would return to pre-construction conditions.

Cat5 Composites

During construction, impacts under this alternative would be the same as discussed under the proposed action. After construction, alternative #3 would affect approximately one-third of Cat5's leased property at the northern end and would also traverse the frontage on the Industrial Canal where Cat5 would like to build docks and ramps.

Halliburton/Baroid/Dresser

Under alternative #3, both during and following construction, the alignment would continue to make it necessary to unload all ore barges along the east bank of the IHNC, and require moving a floating crane to the location for discharging material from barges to the bank. The unloading vendor does not own equipment mounted on a barge. Operational costs are generally greater to unload from a floating crane due to insurance costs. Mobilizing a floating crane in and out of each shop arrival would also increase operations costs.

Alternative #3 during construction would result in operational interruptions due to relocation of the New Orleans Public Belt Rail lines which the Halliburton plant uses for materials receipt and delivery. It is necessary for this company to have the ability to receive raw material and ship out finished product by barge during the entire construction project. Logistically, it would not be cost-feasible for Halliburton to import sufficient material to stockpile to offset potential down-time resulting from construction-related interruptions. While the plant has been able to order surplus materials in the past to off-set impact from the repair of the Mississippi River locks, operational impacts are in part based on supply and demand from the supply quarry overseas. If demand is particularly high, orders may not be able to be filled in a timely manner. While alternative quarry locations exist overseas, their current source is preferred due to quality and price considerations.

Holcim Cement

Holcim relies on long barge (340 ft) shipments from the GIWW that require the functionality of the Turning Basin. The Turning Basin would lose its functionality during the construction of this alternative as well as after the project's completion. Therefore, Holcim would experience permanent detrimental impacts from the construction of alternative #3.

Orleans Materials

The impacts from alternative #3, both during and following construction, would generally be the same as described for the proposed action.

Lake Pontchartrain Properties (RV park)

During construction of alternative #3, this facility would experience the same impacts as described for the proposed action. In addition, during and after construction, this alternative would impact approximately 30 percent of present development and approximately 50 percent of the proposed future development (homes and structures).

Seabrook Marine

The impacts from alternative #3, both during and following construction, would generally be the same as described for the proposed action.

Trinity Yachts

The impacts from alternative #3, both during and following construction, would generally be the same as described for the proposed action. Trinity Yachts does have operational need of the Turning Basin. Therefore, the loss of functionality of the Turning Basin under alternative #3 during and following construction would impact this facility.

Trinity Marine Products

The impacts from alternative #3, both during and following construction, would generally be the same as described for the proposed action.

Impacts to US Gypsum

The impacts from alternative #3, both during and following construction, would generally be the same as described for the proposed action.

*Indirect Impacts to Socioeconomics*

Local Economy

The local economy would experience the same generally beneficial impacts under this alternative as described for the proposed action. Additional impacts may be experienced by the port. As the owner of the Turning Basin, the port would experience adverse impacts from loss of tenants who rely on the functional use of the Turning Basin such as Halliburton on the northern end of the Turning Basin. Under alternative #3, the port's largest lease holder in terms of land area associated with this project's area of potential effect (the 20-acre RV park) would also be severely impacted. Should the RV park lose its customer base due to selection of alternative #3, the port could lose this customer and would need to renegotiate its longest-term lease (currently through 2041).

ROW Acquisition

Construction would require acquisition of new ROW. All alternatives would utilize the same construction staging area: an approximately 9.5-acre area consisting primarily of Shavers-Whittle property at 6401 France Road and 2.5 acres of adjacent open water for approximately 36 months.

Alternative #3 would result in obtaining approximately 37 acres of ROW: approximately 18 acres for permanent ROW, 12 acres for temporary construction easements, and 7 acres for raising existing I-walls to T-walls. Acquisitions would be required from the Port of New Orleans affecting the following: Shavers-Whittle, Cat5 Composites, Lake Pontchartrain Properties, Halliburton, and the Morrison Yard Wharf.

Facility and Utility Relocations

Alternative #3 would require relocation of portions of France Road and Jourdan Road, fencing, railroad track, retaining wall, 2 fire hydrants, sanitary sewer, overhead power lines, 10 power poles, and 9 transformers. Properties would be affected at Lake Pontchartrain Properties, Cat5 Composites, Halliburton, including facilities/utilities owned by Entergy, the Sewerage and Water Board of New Orleans, and rail facilities owned by New Orleans Public Belt Railroad.

*Cumulative Impacts to Socioeconomics*

Cumulative impacts under alternative #3 would be the same as those defined for the proposed action.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

*Direct Impacts to Socioeconomics*

Alternative #4 would result in the greatest degree of adverse impacts to the IHNC users, both during and following construction. Navigational access would be restricted for approximately 6 months to 12 months during its construction, and following construction, this alternative would provide 100-year flood risk reduction to the fewest number of tenants and resources along the IHNC.

<u>Residential</u>

In terms of impacts to the two adjacent neighborhoods, alternative #4 would affect more residents than the proposed action due to their proximity to the alignment. The impacted residents' homes are immediately adjacent to the existing levee that the project would tie into. Because of the proximity of these homes to the levee, residents of these homes would experience noise impacts during construction. Noise would be regulated in accordance with the City of New Orleans Ordinance 23263, Chapter 66, Article IV regarding noise.

<u>Port of New Orleans</u>

During construction of alternative #4, direct impacts to the Port would generally be the same as described under the proposed action. Following construction, access to the Port's maintenance facility at the southern end of the Turning Basin would be obstructed.

<u>U.S. Coast Guard</u>

The potential impacts under alternative #4 would be the same as for the proposed action.

<u>New Orleans Public Belt Railroad</u>

Alternative #4 would result in impacts during construction due to service interruptions to relocate track and construct rail gates. Approximately 2,185 ft of track would need to be relocated.

<u>Cat5 Composites</u>

In addition to the impacts described under the proposed action, alternative #4 would place a small portion of the construction zone on a small portion of the Cat5 property.

<u>Halliburton/Baroid/Dresser</u>

During construction, alternative #4 would also result in operational interruptions due to relocation of the New Orleans Public Belt Rail lines which the Plant uses for materials receipt and delivery as described in alternative #3. Following construction, this alternative would have less impact on Halliburton than the proposed action because it would not disrupt Halliburton's ability to continue using the Turning Basin as it does currently.

<u>Holcim Cement</u>

Alternative #4 would result in operational interruptions due to relocation of the New Orleans Public Belt Rail lines which the Plant uses for materials receipt and delivery. There are no impacts anticipated following construction.

Orleans Materials

The impacts to Orleans materials under alternative #4, both during and following construction, would be the same as those described for the proposed action.

Lake Pontchartrain Properties (RV park)

Impacts to this facility would be similar to, although greater in magnitude than, those described under alternative #3. Alternative #4 would affect 50 percent of the present development, and all of the proposed future development in that existing operations and infrastructure would need to be relocated into the area reserved for future mixed-use development, thereby completely changing the long-term land use plans for the park. It would render their northern slip sight unusable. It may also necessitate demolition of the business's existing office building and other infrastructure. In addition to impacts on future RV park land use and potential impacts to existing buildings, the RV park tenants would be temporarily exposed to noise from construction activities. Given the proximity of alternative #4 to the RV park, noise from certain activities such as pile driving could be intense enough to encourage tenants to vacate the park until construction is completed. The repercussions of these actions would be felt after construction is complete as well.

Seabrook Marine

Direct impacts to Seabrook Marine during and after construction of alternative #4 would be the same as described under the proposed action.

Trinity Yachts

Direct impacts to Trinity Yachts during and after construction of alternative #4 would be the same as described under the proposed action.

Trinity Marine Products

Direct impacts to Trinity Marine Products during and after construction of alternative #4 would be the same as described under the proposed action.

Direct Impacts to US Gypsum

Direct impacts to US Gypsum during and after construction of alternative #4 would be the same as described under the proposed action.

*Indirect Impacts to Socioeconomics*

Local Economy

The local economy would experience the same generally beneficial impacts under this alternative as described for the proposed action.

ROW Acquisition

Construction would require acquisition of new ROW. All alternatives would utilize the same construction staging area: an approximately 9.5-acre area consisting primarily of Shavers-Whittle property at 6401 France Road and 2.5 acres of adjacent open water in Slip No. 6 for approximately 36 months.

Alternative #4 would result in obtaining a total of approximately 36 acres of ROW; approximately 15 acres would be required for permanent ROW and easements, 12 acres for temporary construction easements, and 9 acres for raising existing I-walls to T-walls. Acquisitions would be required from the Port of New Orleans affecting the following: Cat5 Composites, Lake Pontchartrain Properties, and the Morrison Yard Wharf.

Facility and Utility Relocations

Alternative #4 would require the relocation of a portion of concrete slab at the Morrison Yard Wharf, numerous RV hookups and facilities at the Lake Pontchartrain Park including the office, swimming pool, pond, and boat launch; chain link fence, sanitary sewer, portions of France Road and Jourdan Road, railroad track, power poles, drain line, and retaining wall and sheet piling at Morrison Yard Wharf. Properties would be affected at the Morrison Yard Wharf, Cat5 Composites, and Lake Pontchartrain Properties, including facilities/utilities owned by the Department of Transportation, Entergy, and the Sewerage and Water Board of New Orleans, and rail facilities owned by New Orleans Public Belt Railroad.

*Cumulative Impacts to Socioeconomics*

Cumulative impacts under alternative #4 would be similar to those defined for the proposed action.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

*Direct Impacts to Socioeconomics*

Alternative #5 would have the fewest impacts on socioeconomic resources that use the project area due to its location in the lake (away from residential, industrial, and commercial properties) and because limited navigation could be maintained through the Seabrook Pass during construction.

Residential

Due to this alternative's location in the lake, rather than in the IHNC, noise impacts to the residential neighborhoods adjacent to the IHNC would be much less under this alternative as compared to the other alternatives. The duration of construction noise would be longer due to the longer construction period allotted for this alternative; however, noise would be regulated in accordance with the City of New Orleans Ordinance 23263, Chapter 66, Article IV regarding noise.

Industrial/Commercial

Alternative #5 would not have any direct impacts on the industrial or commercial facilities that use the project area.

*Indirect Impacts to Socioeconomics*

Local Economy

The local economy would experience the same generally beneficial impacts under this alternative as described for the proposed action.

ROW Acquisition

Construction of alternative #5 would require acquisition of new ROW from the state of Louisiana. This alternative would require a total of approximately 34 acres of temporary and permanent ROW, including approximately 12 acres of permanent easements and 21 acres for temporary construction easements.

Facility and Utility Relocations

Alternative #5 would require minimal relocations of facilities/utilities including a concrete road, chain link fence, drain line, and one drop inlet.

*Cumulative Impacts to Socioeconomics*

Cumulative impacts under alternative #5 would be the same as those defined for the proposed action.

## 3.4 ENVIRONMENTAL JUSTICE

Environmental Justice (EJ) is institutionally significant because of Executive Order 12898 of 1994 and the Department of Defense's Strategy on Environmental Justice of 1995, which direct Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of Federal actions on minority and/or low-income populations. The USEPA defines EJ as “the fair and equitable treatment (fair treatment and meaningful involvement) of all people with respect to environmental and human health consequences of federal laws, regulations, policies, and actions."

The methodology to accomplish this analysis includes identifying low-income and minority populations within the study area using up to date economic statistics, aerial photographs, 2000 Census data (USCB 2000), Environmental Systems Research Institute, Inc. (ESRI) estimates (ESRI 2008), as well as conducting community outreach activities such as small neighborhood focus meetings. The smallest political unit(s) containing an EJ project area is/are considered the reference community of comparison, whose population is therefore considered the reference population for comparison purposes. A potential disproportionate impact may occur when the percent minority and/or percent low-income population in an EJ study area are greater than those in the reference community. References cited in this EJ section explain this rationale in more detail.

The sources for the data used in the analysis include aerial imagery and the 2000 U.S. Census and estimates from ESRI. Despite the 2000 U.S. Census being 9 years old, it serves as a logical baseline of information for the following reasons:

- Census 2000 data is the most accurate source of data available due to the sample size of the Census decennial surveys; with one of every six households surveyed, the margin of error is negligible;

- The Census reports data at a much smaller geographic level than other survey sources, providing a more defined and versatile option for data reporting; and

- Census information sheds light upon the demographic and economic framework of the area, pre-Hurricane Katrina. By accounting for the absent population, the analysis does not exclude potentially low-income and minority families that wish to return home.

Due to the considerable impact of Hurricane Katrina upon the New Orleans Metropolitan area and the likely shift in demographics and income, the 2000 Census data are supplemented with more current data, including 2008 estimates and 2013 projections provided by ESRI. For this analysis, an area within a 1-mile radius of the IER #11 proposed action footprint was surveyed and evaluated as the IER #11 EJ study area.

<u>Existing Conditions</u>

The IER #11 Tier 2 Pontchartrain project area is located in the Seabrook area of New Orleans, at the confluence of Lake Pontchartrain and the IHNC. According to the 2000 Census and 2008 ESRI estimates, the area within a 1-mile radius of the project's footprint, in various reaches of the project work, includes low-income or minority groups, particularly in the areas of the IHNC and vicinity in Orleans Parish. The minority population in the area is greater than 50 percent, and is not substantially different than the percentage of minorities within Orleans Parish. Similarly, the percentage of the populations living below the poverty line was comparable to the Orleans Parish figure and significantly lower than the State of Louisiana figure for 2000. Based on the available descriptions of the project and work site locations, the area within a 1-mile radius of the project footprint, in various reaches of the work in Orleans Parish, are temporary and permanent residences to the west; but are primarily industrial in nature to the south and east of the project area, where the greatest direct impacts would occur.

<u>Discussion of Impacts</u>

***Proposed Action (Alternative #1) - Bridgeside Alignment: Sector Gate located 540 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls built on Existing Levees***

Minority and/or low income communities are located within 1- mile of the proposed action alignment. With implementation of the proposed action, impacts from project construction activities such as air quality, noise, traffic, safety, etc. would occur, but are usually limited to within 1-mile of the project area, are temporary in nature, and would equally impact non-minority/non-low populations as well. Direct impacts from the proposed alignment would include the acquisition of public or industrial property in an industrial area on the northern end and in an uninhabited area to the southern end of the project area. Acquisition of residential property is not anticipated in this project area.

All population groups inside the HSDRRS system would benefit equally from the completed risk reduction system. Thus, disproportionately adverse human health and environmental impacts would not be anticipated on minority and/or low income communities from the proposed action.

***Alternative #2 - Bridgeside Alignment: Sector Gate located 398 ft south of Seabrook Bridge and approximately 1,300 ft of T-walls built on Existing Levees***

Direct, indirect, and cumulative impacts from alternative #2 would be similar to those described under the proposed action.

***Alternative #3 - Turning Basin Alignment: Sector Gate located 1,500 ft south of Seabrook Bridge and approximately 1,500 ft of T-walls***

Minority and/or low income communities are located adjacent to the northwest and southwest of the alternative #3 alignment. With implementation of the alternative #3, impacts from project construction activities such as air quality, noise, traffic, safety, etc. would occur, but are usually limited to within 1-mile of the project area, would be temporary in nature, and would equally impact non-minority/non-low populations as well. Acquisition of residential property is not anticipated in this project area.

All population groups inside the HSDRRS system would benefit equally from the completed risk reduction system. Thus, disproportionately adverse human health and environmental impacts are not anticipated on minority and/or low income communities from alternative #3.

***Alternative #4 – South of Turning Basin Alignment: Sector Gate located 2,000 ft south of Seabrook Bridge and approximately 1,450 ft of T-walls***

There are two residential communities immediately adjacent to the alternative #4 alignment. With implementation of alternative #4, impacts from project construction activities such as air quality, noise, traffic, safety, etc. would occur, but are usually limited to within 1-mile of the project area, would be temporary in nature and would equally impact non-minority/non-low populations as well. Direct impacts from the proposed alignment would include the acquisition of public or industrial property for ROW. Acquisition of residential property is not anticipated in this project area.

All population groups inside the HSDRRS system would benefit equally from the completed risk reduction system. Thus, disproportionately adverse human health and environmental impacts are not anticipated on minority and/or low income communities from alternative #4.

***Alternative #5 – Lake Pontchartrain Alignment: Sector Gate located 502 ft north of the Seabrook Bridge and approximately 1,800 ft of T-walls***

There are no residential communities adjacent to the alternative #5 alignment. Impacts from construction activities such as air quality, noise, traffic, etc., would not be exerted on any community groups. Direct impacts from the proposed alignment would include the acquisition of public or industrial property for ROW in the project area. Acquisition of residential property is not anticipated in this project area.

All population groups inside the HSDRRS system would benefit equally from the completed risk reduction system. Thus, disproportionately adverse human health and environmental impacts are not anticipated on minority and/or low income communities from alternative #5.

## 3.5 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The USACE is obligated under ER 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all hazardous, toxic, and radioactive waste (HTRW) contamination within the vicinity of the proposed action. ER 1165-2-132 identifies CEMVN HTRW policy to avoid the use of project funds for HTRW removal and remediation activities. Costs for necessary special handling or remediation of wastes (e.g., Resource Conservation and Recovery Act [RCRA] regulated), pollutants, and other contaminants, which are not regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), will be treated as project costs if the requirement is the result of a validly promulgated Federal, state, or local regulation.

An American Society for Testing and Materials (ASTM) International E 1527-05 Phase I ESA was completed for the project area(s). A copy of the Phase I ESA will be maintained on file at the CEMVN. The Phase I ESA documented the Recognized Environmental Conditions (RECs) for the proposed action areas, and a Phase II was conducted to further analyze suspected contaminants. If a REC cannot be avoided, due to construction requirements, the CEMVN may further investigate the REC to confirm the presence or absence of contaminants, and actions to avoid possible contaminants. Federal, state, or local coordination may be required. Because the CEMVN plans to avoid RECs, the probability of encountering HTRW in the project area is low.

An ASTM E 1903-97 Phase II ESA was completed to further verify the nature of sediments at proposed construction footprint(s) of the closure gates in the proposed action area(s). The Phase I and Phase II ESAs referenced below will be maintained on file at the office of the CEMVN and are incorporated herein by reference. Copies of the reports are available by requesting them from the CEMVN, or accessing them at www.nolaenvironmental.gov.

The following Phase I and Phase II ESAs were prepared for the CEMVN in November 2006 (Phase I ESA), December 2007 (Phase II ESA) and November 2009 (Final Limited Phase II ESA) in accordance with ASTM International E 1527-05, ASTM E 1903-97 and USACE ER 1165-2-131 (Materials Management Group, Inc. 2006a; 2006b; 2006c; 2007):

- Final Phase I ESA – Seabrook Site, New Orleans, Louisiana;
- Final Phase II ESA – Proposed Closure Structures – Seabrook, GIWW-MRGO, Michoud Slip, New Orleans, Louisiana.
- Final Limited Phase II ESA – Proposed Seabrook Gate Location, New Orleans, Louisiana

These ESAs are located within the study area. Relevant and significant findings and recommendations are summarized below.

**Final Phase I ESA – Seabrook Site, New Orleans, Louisiana (November 2006)**

The site investigated under this ESA is located at the confluence of Lake Pontchartrain and the IHNC. Following the USEPA's All Appropriate Inquiry (AAI) and ASTM Phase 1 guidelines, there are no RECs identified at the site. It should be noted however that LaDEQ required a residential deed restriction, due to the rupture of a used oil tank in 1998, on a property outside of the project area on the west bank of the IHNC.

**Final Phase II ESA – Proposed Closure Structures – Seabrook (December 2007)**

The proposed action site located at the confluence of the IHNC and Lake Pontchartrain (near Seabrook Bridge) was investigated as part of this ESA. The Phase II ESA investigated baseline conditions of the project area.

Based on sampling and testing of sediment collected from a total of 21 boring locations, if sediment near the proposed action construction footprint were excavated or dredged, and subject to land management and disposal, only one location with unacceptable concentrations of contaminants was located. Two contaminants of concern (barium and lead) are present in the sediment above the LaDEQ Risk Evaluation/Corrective Action Program (RECAP) standards at this one location in the canal at Seabrook (Tier 2 Pontchartrain project area). However, these results are below what is considered hazardous waste as defined by CFR 261.24 for barium (http://www.epa.gov/epaoswer/hazwaste/id/hwirwste/hwirprop.txt), and appear to be an isolated occurrence because both barium and lead concentrations in samples from adjacent sediment boring locations in the IHNC at Seabrook are significantly lower. Concentrations of all other contaminants tested, including but not limited to volatiles, semi-volatiles, polychlorinated biphenyls (PCBs), herbicides and pesticides, are below risk levels in the locations where sediment samples were taken. However, based on these analytical results, past and current site usage, and one sediment sample absent from the canal suggests additional investigation. This recommended additional investigation was performed as a Limited Phase II ESA in October 2009 and is discussed in the following section.

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**Final Limited Phase II ESA – Proposed Seabrook Gate Location (November 2009)**

Soil and sediment samples from the proposed Seabrook sector gate construction site south of the Seabrook Bridge and the Bascule Railroad Bridge were investigated as part of this limited ESA. The limited Phase II investigated the soil samples along the proposed floodwall alignments on the east and west banks of the IHNC and the sediment samples where the steel sector gate and retaining walls from the east and west banks tie in.

Based on the sampling and testing of soil and sediments collected from a total of 12 boring locations (3 soil and 3 sediment samples from each side of the bank), the soil samples from the west bank indicated no significant contamination with the exception of barium which exceeded RECAP screening level. The elevated barium concentrations are most likely attributed to historical oil drilling in the area. The east bank had total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), arsenic, and barium levels above RECAP screening levels which may have resulted from a surface spill from boating or historical rail activity. There was no significant contamination identified from sediments on the west side of the IHNC. The PCBs, PAHs, dichlorodiphenyltrichloroethane (DDT) and elevated metals (antimony, lead, and barium) contaminations from the east side of the IHNC sediment samples may have resulted from the existence of historical lead facility in the area and historical oil drilling activities.

Only arsenic and PAHs from soil samples on the east side of bank were above RECAP industrial standards. These locations of elevated concentrations will require appropriate personal protective equipment and precautions for exposures to construction workers during the construction phase. However, four toxicity characteristic leaching procedure (TCLP) results, obtained from composite samples of each side of the bank, indicated the material in each of the investigation areas would be classified as non-hazardous.

Based on the Phase I and Phase II ESA reports of the project area, and because the CEMVN plans to avoid RECs during implementation of the proposed action, the probability of encountering HTRW in the project area is low. Any contaminated soils excavated would be disposed of according to applicable Federal and state laws and regulations.

**HTRW Investigations – ADDENDUM (5 May 2009)**

An addendum to the original Phase I investigated possible current RECs within the project areas that may not have been documented by past investigations, as well as, investigates the status of past noted environmental issues from the IER per Phase I and Phase II ESAs.

**Seabrook**

In February 2009, USACE's Environmental Team conducted another Phase I ESA in the vicinity of the floodwalls lining the IHNC. No new RECs were identified in this assessment; however, the industrialized nature of the area is of note.

On 14 April 2009, CEMVN conducted a site reconnaissance of the Seabrook area. No significant changes appear to have occurred to the adjacent properties since the original Phase I ESA, except some construction activities on the West end of the property. A fenced-in area along the LeRoy Johnson Drive, which used to be the Naval Reserve Training Center, has been demolished and scrap metal and other scrap demolition materials were observed. East of Jourdan Road is the New Orleans Lakefront Airport that owns an active above-ground storage tank (AST) field of four tanks containing aviation gas or AVGAS. The ASTs are immediately adjacent to the target property site for the sector gate construction in Lake Pontchartrain. No RECs or obvious signs of major contamination were discerned during the site reconnaissance of the Seabrook area.

# 4.0 CUMULATIVE IMPACTS

NEPA requires a Federal agency to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action. Direct, indirect, and cumulative impacts of the proposed action are evaluated specifically for each IER, but will also be addressed within the draft CED that is being prepared by the CEMVN. A cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts were addressed for each alternative and resource in the preceding sections.

## 4.1 METHODOLOGY

To successfully assess cumulative impacts, a broad range of activities and patterns of environmental changes that are occurring in the vicinity of the project were considered. The following items were guidelines for the cumulative impact analyses in this document:

- The proximity of the projects to each other, both geographically and temporally.
- The probability of actions affecting the same environmental resource, especially systems that are susceptible to development pressures.
- The likelihood that the project would lead to a wide range of effects or lead to a number of associated projects.
- Whether the effects of other projects are similar to those of the project under review and the likelihood that the project would occur.

## 4.2 DESCRIPTIONS OF PROJECTS CONSIDERED

Rebuilding efforts as a result of Hurricane Katrina are taking place throughout southeast Louisiana and along the Mississippi and Alabama Gulf Coast. The Insurance Information Institute (III) has estimated that the total insured losses from Hurricane Katrina were $40.6 billion in six states, and in Louisiana the insured losses are estimated at $25.3 billion (III 2007). Much of those insured losses would be a component of the regional rebuilding effort. Although the full extent of construction in Orleans and St. Bernard Parishes and throughout the Gulf Coast over the next 5 years to 10 years is unknown, a large-scale rebuilding effort is underway.

The Water Resources Development Act of 2007 (WRDA 07) became law in November 2007. This bill authorized several additional projects and studies in the general vicinity of the IER #11 Tier 2 Pontchartrain project area and could contribute to cumulative impacts. WRDA 07 included authorization of the LPV and WBV HSDRRS projects to raise risk reduction levels to 100-year levels, as well as coastal restoration projects, Morganza to the Gulf hurricane risk reduction, hurricane risk reduction in Jean Lafitte and lower Jefferson Parish, a study of coastal area damage that could be attributable to the USACE, the MRGO closure at Bayou La Loutre, an EIS for the IHNC lock, and the formation of a Coastal Louisiana Ecosystem Protection and Restoration Task Force (Alpert 2007). The majority of these projects or studies still require specific appropriations. The WRDA does not guarantee financing of these projects but does allow Congress to allocate money for them in future spending bills (Alpert 2007). These additional projects could contribute to resource impacts, either adversely or with long-term positive impacts.

As indicated previously, in addition to this IER, the CEMVN is preparing a draft CED that will describe the work completed and the work remaining to be constructed. The purpose of the draft CED will be to document the work completed by the USACE on a system-wide scale. The draft CED will describe the integration of individual IERs into a systematic planning effort. Overall cumulative impacts, a finalized mitigation plan, and future OMRR&R requirements will also be included. The following discussion describes an overview of other actions, projects, and occurrences that may contribute to the cumulative impacts previously discussed.

### 4.2.1 CEMVN HSDRRS IERs

Federal hurricane damage risk reduction for the greater New Orleans area is referred to as the HSDRRS and is divided into three USACE authorized projects: (1) LPV; (2) WBV; and (3) New Orleans to Venice (NOV). The NOV and WBV projects have no or limited discussion in this IER because their alignments are not located within the project region and, with the exception of some positive cumulative impacts to socioeconomics, these projects would not greatly increase cumulative impacts. The various projects that make up the LPV projects include the construction of 125 miles of levees, concrete floodwalls, and other structures. Many of these projects are broken out by area and referred to by their IER document number. Figure 44 shows LPV and WBV IER projects. A summary of the projects that fall within the New Orleans Metropolitan area is provided below:

- **IER #1, LPV, La Branche Wetlands Levee, St. Charles Parish, Louisiana** – evaluates the potential impacts associated with raising approximately 9 miles of earthen levees; replacing over 3,000 ft of floodwalls; rebuilding, modifying or closing five drainage structures; and modifying one railroad gate along the existing levee system on the north side of U.S. 61 (Airline Highway) between the Bonnet Carré Spillway and the northwest end of the Louis Armstrong New Orleans International Airport near the St. Charles/Jefferson Parish line.

- **IER #2, LPV, West Return Floodwall Jefferson and St. Charles Parishes, Louisiana** – evaluates the potential impacts associated with the proposed replacement of 17,900 ft (3.4 miles) of floodwalls along the line between Jefferson Parish and St. Charles Parish in the northeastern portion of the Mississippi River deltaic plain. The project area is adjacent to the Parish Line Canal from the north side of the Louis Armstrong New Orleans International Airport to the south shore of Lake Pontchartrain.

- **IER #3, LPV, Lakefront Levee, Jefferson Parish, Louisiana** – evaluates the potential impacts associated with the proposed rebuilding of 9.5 miles of earthen levees, upgrading of the foreshore protection, the replacement of two floodgates, the construction of fronting protection, and construction or modification of breakwaters at four pumping stations just east of the St. Charles Parish and Jefferson Parish line to the western side of the 17th Street Canal.

- **IER #4, LPV, New Orleans Lakefront Levee, Orleans Parish, Louisiana** – investigates improvement of the levee, floodwall, and Bayou St. John Sector Gate extending from the 17th Street Canal to the IHNC.

- **IER #5, LPV, Permanent Protection System for the Outfall Canals Project on 17th Street, Orleans Avenue, and London Avenue Canals, Jefferson and Orleans Parishes, Louisiana** – evaluates the impacts of a new permanent pump station and closure (i.e. gates) at or near the mouth of each of the outfall canals operating in series with the existing Sewerage and Water Board of New Orleans pump stations.

- **IER #6, LPV, New Orleans East, Citrus Lakefront Levee, Orleans Parish, Louisiana** – investigates improvement of approximately 6 miles of levees, floodwalls, and floodgates that extend from the IHNC and the New Orleans Lakefront Airport east to Paris Road – locally known as the Citrus Lakefront. Foreshore protection enhancements along this reach could include the dredging of access channels in Lake Pontchartrain.

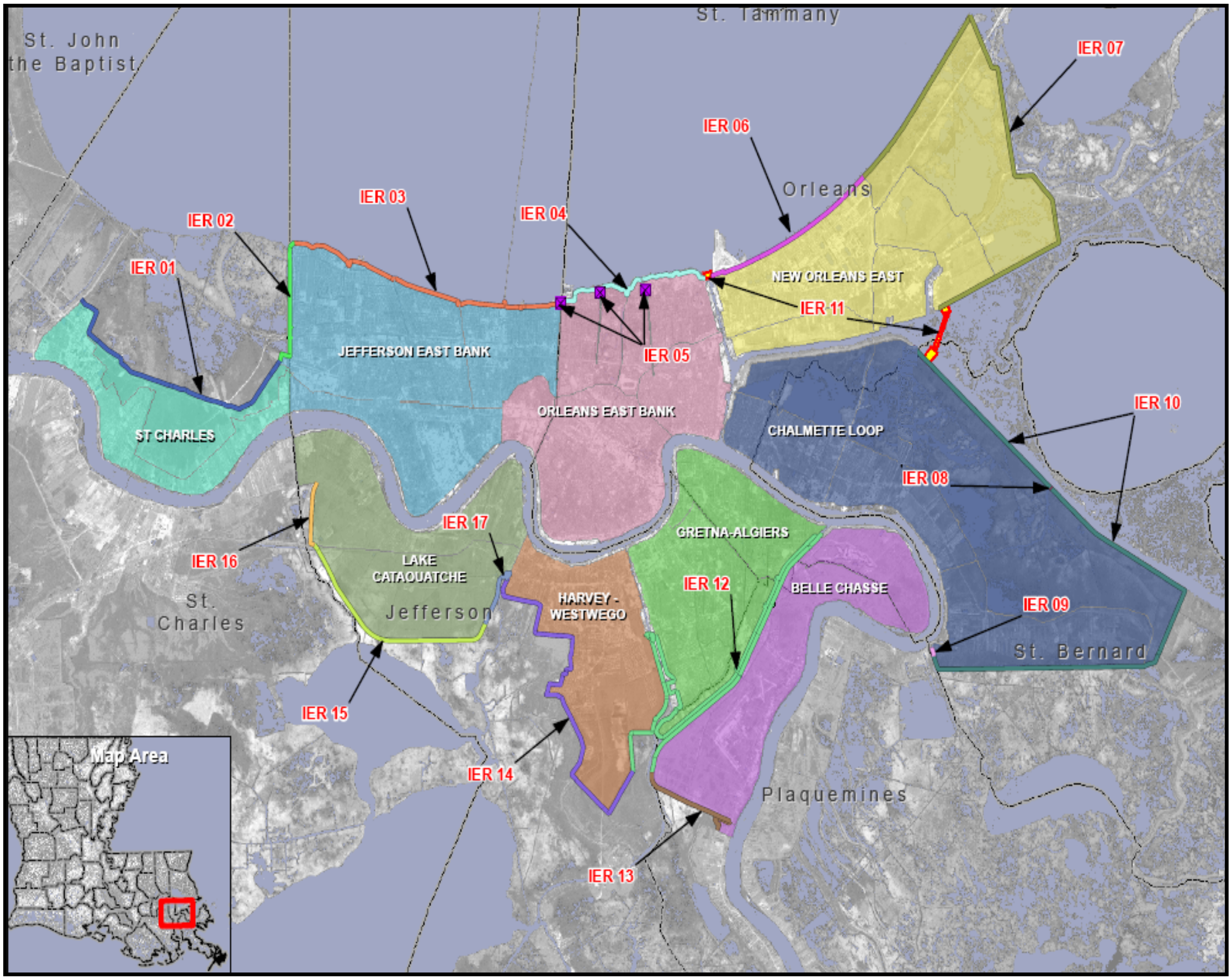


**Figure 44. HSDRRS Lake Pontchartrain and Vicinity and West Bank and Vicinity IER Projects**

- **IER #7, LPV, New Orleans East, New Orleans East Lakefront to Michoud Canal, Orleans Parish, Louisiana** – investigates improvement of approximately 19.3 miles of levee and three floodgates stretching from the New Orleans East Lakefront Levee to New Orleans East Back Levee – CSX Railroad to Michoud Canal. This portion of the LPV HSDRRS encompasses a large portion of the Bayou Sauvage National Wildlife Refuge (NWR). The northern portion of this reach could include foreshore protection enhancements requiring dredged access channels in Lake Pontchartrain.

- **IER #8, LPV, Bayou Dupre Control Structure, St. Bernard Parish, Louisiana** – evaluates the impacts of the construction of a new flood control structure on Bayou Dupre with steel sector gates and floodwall tie-ins, constructed on the floodside of and adjacent to the existing structure.

- **IER #10, LPV, Chalmette Loop Levee, St. Bernard Parish, Louisiana** – evaluates the impacts of constructing a T-wall on top of the existing Chalmette Loop levee.

- **IER #11, Improved Protection on the IHNC, Orleans and St. Bernard Parishes, Louisiana (Tier 2 Borgne)** – evaluates the potential impacts associated with constructing surge barriers on Lake Borgne. This is the Tier 2 review for alternatives to protect against storm surge from the IHNC originating from Lake Borgne. This project was initially evaluated in IER #11 Tier 1 (USACE 2008a). Currently, this project is under construction; dredging and piles tests are complete and approximately 1.2 million cubic yards of dredged material has been beneficially used for marsh nourishment within 205 acres of open water ponds near the project area.

- **IER #11, Improved Protection on the IHNC, Orleans and St. Bernard Parishes, Louisiana (Tier 2 Borgne Supplemental)** – evaluates the potential impacts associated with constructing a vertical lift gate on Bayou Bienvenue in lieu of a sector gate, which was evaluated in the original Tier 2 Borgne document.

- **IER #12, GIWW WCC, Harvey, and Algiers Levees and Floodwalls, Jefferson, Orleans, and Plaquemines Parishes, Louisiana** – includes a sector gate across the GIWW and levee tie-ins to the adjacent Hero Canal levee to the east and the V-line levee to the west. Approximately 3 miles of levee and floodwall would be constructed, along with a closure complex across the GIWW, a pump station, fronting protection, and a bypass channel. Levees would generally be raised to 14 ft, requiring 3.1 million cubic yards of earthen material and 310,000 tons of stone.

- **IER #13, WBV, Hero Canal Levee and Eastern Terminus, Plaquemines Parish, Louisiana –** evaluates 22,000 LF of levee improvements and the construction of 1,500 LF of floodwalls.

- **IER #14, WBV, Westwego to Harvey Levee, Jefferson Parish, Louisiana –** evaluates 12 miles of levee, construction of 7,013 LF of floodwalls, and modifications to three pump stations.

- **IER #15, WBV, Lake Cataouatche Levee, Jefferson Parish, Louisiana –** evaluates 8 miles of levee and fronting protection modifications for one pump station.

- **IER #16, WBV, Western Tie-In, Jefferson and St. Charles Parishes, Louisiana –** evaluates construction of a new levee section to complete the western terminus of the West Bank and Vicinity Hurricane Protection Project.

- **IER #17, WBV Company Canal Floodwall, Jefferson Parish, Louisiana –** evaluates 442 LF of floodwalls and fronting protection modifications to two pump stations.

- **IER #18 - Government Furnished Borrow Material, Jefferson, Orleans, Plaquemines, St. Charles, and St. Bernard Parishes, Louisiana and IER #19 – Pre-Approved Contractor Furnished Borrow Material, Jefferson, Orleans, St. Bernard, Iberville, and Plaquemines Parishes, Louisiana, and Hancock County, Mississippi** – The purpose of these two IERs is to identify borrow areas that contain suitable material that can be excavated to supply clay material to Federal HSDRRS levee and floodwall projects.

- **IER #20, LPV Hurricane Protection Project – Mitigation: Manchac Wildlife Management Area Shoreline Protection Modification, St. John the Baptist Parish, Louisiana** – This mitigation IER will be completed to document the mitigation plan for unavoidable impacts from the resulting actions of the aforementioned IERs #1 to #11.

- **IER #21, WBV Hurricane Protection Project – Mitigation** – This mitigation IER will be completed to document the mitigation plan for unavoidable impacts from the resulting actions of the aforementioned IERs #12 to #17.

- **IER #22, Government Furnished Borrow Material #2, Jefferson and Plaquemines Parishes, Louisiana and Hancock County, Mississippi** – evaluates the potential impacts associated with the actions taken by the USACE while excavating borrow areas for use in construction of the HSDRRS.

- **IER #23, Pre-Approved Contractor Furnished Borrow Material #2, St. Bernard, St. Charles, Plaquemines Parishes, Louisiana, and Hancock County, Mississippi** – evaluates the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- **IER #24, Stockpile Sites for Borrow Material, Orleans and St. Bernard Parishes, Louisiana** – evaluates the potential impacts associated with the actions taken by commercial contractors as a result of stockpiling borrow material for use in construction of the HSDRRS.

- **IER #25, Government Furnished Borrow Material #3, Orleans, Jefferson, and Plaquemines Parishes, Louisiana** – evaluates the potential impacts associated with the actions taken by the USACE while excavating borrow areas for use in construction of the HSDRRS.

- **IER #26, Pre-Approved Contractor Furnished Borrow Material #3, Jefferson, Plaquemines, and St. John the Baptist Parishes, Louisiana, and Hancock County, Mississippi** – evaluates the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- **IER #28, Government Furnished Borrow Material #4, Plaquemines, St. Bernard, and Jefferson Parishes** – evaluates the potential impacts associated with the possible excavation of two government furnished borrow areas, and an access road to a previously-approved government furnished borrow area.

- **IER #29, Pre-Approved Contractor Furnished Borrow Material #4, Orleans, St. John the Baptist, and St. Tammany Parishes -** evaluates the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- **IER #30, Contractor-Furnished Borrow Material #5, St. Bernard and St. James Parishes, Louisiana, and Hancock County, Mississippi -** evaluates the potential impacts associated with the actions taken by commercial contractors as a result of excavating three proposed borrow areas for use in construction of the HSDRRS.

A discussion of habitat restoration, stabilization, and creation projects that would contribute to cumulative impacts to resources in the IER #11 – Tier 2 Pontchartrain study area are discussed in the following section.

Table 15 provides a summary of the cumulative impacts to be mitigated for the HSDRRS based on the IERs completed (draft or final) to date. In addition to the impacts shown in table 15, approximately 170.5 acres of impacts to forested habitats requiring mitigation would occur as part of projects for the raising of the Mississippi River Levee.

**Table 15.**
**HSDRRS Impacts and Compensatory Mitigation to be Completed**

| IER # | Parish | | Non-wet BLH (acres) | Non-wet BLH AAHUs | Marsh (acres) | Marsh AAHUs | Swamp (acres) | Swamp AAHUs | Wetland BLH (acres) | Wetland BLH AAHUs | Water Bottoms (acres) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | St. Charles | Protected Side | - | - | - | - | 73.23 | 39.53 | - | - | - |
| | | Flood Side | - | - | - | - | 38.48 | 29.73 | - | - | |
| 1 Supplemental | St. Charles | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 2 | Jefferson/St. Charles | Protected Side | - | - | 17.00 | 9.00 | - | - | - | - | - |
| | | Flood Side | - | - | 17.00 | 9.00 | - | - | - | - | |
| 3 | Jefferson | Protected Side | - | - | - | - | - | - | - | - | 26.40 |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 4 | Orleans | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 5 | Jefferson/Orleans | Protected Side | - | - | - | - | - | - | - | - | 3.29 |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 6 | Orleans | Protected Side | - | - | - | - | - | - | - | - | 6.90 |
| | | Flood Side | - | - | 4.00 | TBD | - | - | - | - | |
| 7 | Orleans | Protected Side | - | - | 100.40 | 36.80 | - | - | 151.70 | 79.30 | 106.00 |
| | | Flood Side | - | - | 70.00 | 37.20 | - | - | 30.00 | 11.90 | |
| 8 | St. Bernard | Protected Side | - | - | - | - | - | - | - | - | 0.30 |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 9 | St. Bernard/Plaquemines | Protected Side | 8.3 | 3.84 | 1.3 | 1.1 | - | - | - | - | 0.30 |
| | | Flood Side | 1.76 | 0.81 | 0.6 | 0.1 | - | - | 1.16 | 0.66 | |
| 10 | St. Bernard | Protected Side | - | - | 106.55 | 57.31 | - | - | 38.32 | 16.44 | 95.00 |
| | | Flood Side | - | - | 323.04 | 209.94 | - | - | 35.31 | 15.22 | |
| 11 Borgne | Orleans/St. Bernard | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | 122.00 | 24.33 | - | - | 15.00 | 2.59 | |
| 11 Pontchartrain | Orleans | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| 12 | Jefferson/Plaquemines | Protected Side | - | - | - | - | - | - | 251.70 | 177.30 | - |
| | | Flood Side | - | - | - | - | 74.90 | 38.50 | 2.30 | 1.90 | |
| 13 | Plaquemines | Protected Side | - | - | - | - | 1.00 | 0.66 | 40.00 | 24.01 | - |
| | | Flood Side | - | - | 20.00 | - | - | - | 4.00 | 2.23 | |
| 14 | Jefferson | Protected Side | - | - | - | - | - | - | 45.00 | 30.00 | - |
| | | Flood Side | - | - | - | - | 29.75 | 17.02 | 45.50 | 18.58 | |
| 15 | Jefferson | Protected Side | - | - | - | - | - | - | 23.50 | 6.13 | - |
| | | Flood Side | - | - | - | - | - | - | 3.60 | 1.35 | |
| 16 | Jefferson | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | 137.80 | 66.30 | - | - | - | - | |
| 17 | Jefferson | Protected Side | - | - | - | - | - | - | 5.50 | 2.69 | - |
| | | Flood Side | - | - | - | - | 19.00 | 17.09 | - | - | |
| Borrow 18 | St. Bernard/Orleans/Jefferson/Plaquemines/St. Charles | Protected Side | 379.30 | 152.32 | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| Borrow 19 | Hancock County, MS/Iberville/New Orleans/Plaquemines/St. Bernard/Jefferson | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| Borrow 22 | Jefferson/Plaquemines | Protected Side | 244.69 | 118.54 | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| Borrow 23 | Hancock County, MS/Plaquemines/St. Bernard/St. Charles | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| Borrow 25 | Jefferson/Orleans/Plaquemines | Protected Side | 933.00 | 284.00 | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |

**Table 15.**
**HSDRRS Impacts and Compensatory Mitigation to be Completed**

| IER # | Parish | | Non-wet BLH (acres) | Non-wet BLH AAHUs | Marsh (acres) | Marsh AAHUs | Swamp (acres) | Swamp AAHUs | Wetland BLH (acres) | Wetland BLH AAHUs | Water Bottoms (acres) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Borrow 26** | Jefferson/Plaquemines/St. John the Baptist/Hancock County, MS | Protected Side | - | - | - | - | - | - | - | - | - |
| | | Flood Side | - | - | - | - | - | - | - | - | |
| **Borrow 28** | Jefferson/Plaquemines/St. Bernard | Protected Side | **19.94** | **8.45** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| | | Flood Side | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| **Borrow 29** | Orleans/St. Tammany/St. John the Baptist | Protected Side | **107.30** | **48.60** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| | | Flood Side | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | |
| **Total** | | Protected Side | **1692.53** | **615.75** | **225.25** | **104.21** | **74.23** | **40.19** | **555.72** | **335.87** | **-** |
| | | Flood Side | **1.76** | **0.81** | **694.44** | **346.87** | **162.13** | **102.34** | **136.87** | **54.43** | **238.19** |
| | | Both | **1694.29** | **616.56** | **919.69** | **451.08** | **236.16** | **142.53** | **692.59** | **390.30** | **238.19** |

- = Not applicable to the IER or the number impacted is 0.
AAHU = average annual habitat unit, BLH = bottomland hardwood, EFH = essential fish habitat, TBD = to be determined.

### 4.2.2 Habitat Restoration, Creation, and Stabilization Projects

#### 4.2.2.1 Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Program Projects

The CEMVN and other Federal and state agencies participate in coastal restoration projects through the CWPPRA (also known as the Breaux Act). These are specific prioritized restoration projects implemented coast-wide by the USACE in cooperation with the LaDNR Coastal Restoration Division and other Federal agencies. Within the Lake Pontchartrain Basin, there are 14 projects proposed or constructed under CWPPRA that are designed to restore, enhance, or build marsh habitat and prevent erosion of marsh habitat. The projects involve numerous protection and restoration methods, including rock-armored shoreline protection breakwaters, dredged-material marsh construction, marsh terracing and planting, freshwater and sediment diversion projects, and modification or management of existing structures. Figure 45 indicates the locations of and table 16 lists and provides additional detail for CWPPRA projects in the region of the study area.

One restoration project is the Caernarvon Freshwater Diversion Canal (CFDC). The CFDC consists of a diversion structure containing five 15-ft square gated culverts and inflow and outflow channels that (as designed) can discharge freshwater and associated nutrients at the rate of 8,000 cubic fps from the Mississippi River to the Plaquemines Wetland Area (PWA) and the coastal bays and marshes in Breton Sound (USACE 1998). Management of the CFDC is expected to prevent approximately 95 percent of the marsh loss predicted for the next 50 years within the Breton Sound (Louisiana Coastal Wetlands Conservation and Restoration Task Force [LCWCRTF] and WCRA 1998 and 1999). Studies indicate that this project has already increased oyster harvests, largemouth bass catches, freshwater and brackish marsh, waterfowl usage, and alligator and muskrat nests (USACE 1998).

Two additional federally sponsored shoreline restoration projects on Lake Borgne and the MRGO (project numbers PO 30 and 32) are the larger CWPPRA projects within the IER #11 Tier 2 Pontchartrain project area. The Lake Borgne and MRGO shoreline restoration projects would maintain the integrity of existing marsh and would also help preserve the existing shorelines in this area. The projects are currently under construction, and an EIS is being developed for the remainder of the proposed work. One of the projects under construction provides a breakwater along the southern Lake Borgne shoreline from Doullut's Canal to Jahnke's Ditch. The second project under construction involves foreshore protection along the north bank of the MRGO between river miles 39.9 and 44.4. Future projects could involve wetland creation through the placement of material dredged from the waterbottoms of Lake Borgne and the construction of retention dikes, where needed, to contain the hydraulically dredged material and facilitate stacking to an elevation supportive of wetland vegetation while minimizing adverse impacts to water quality.

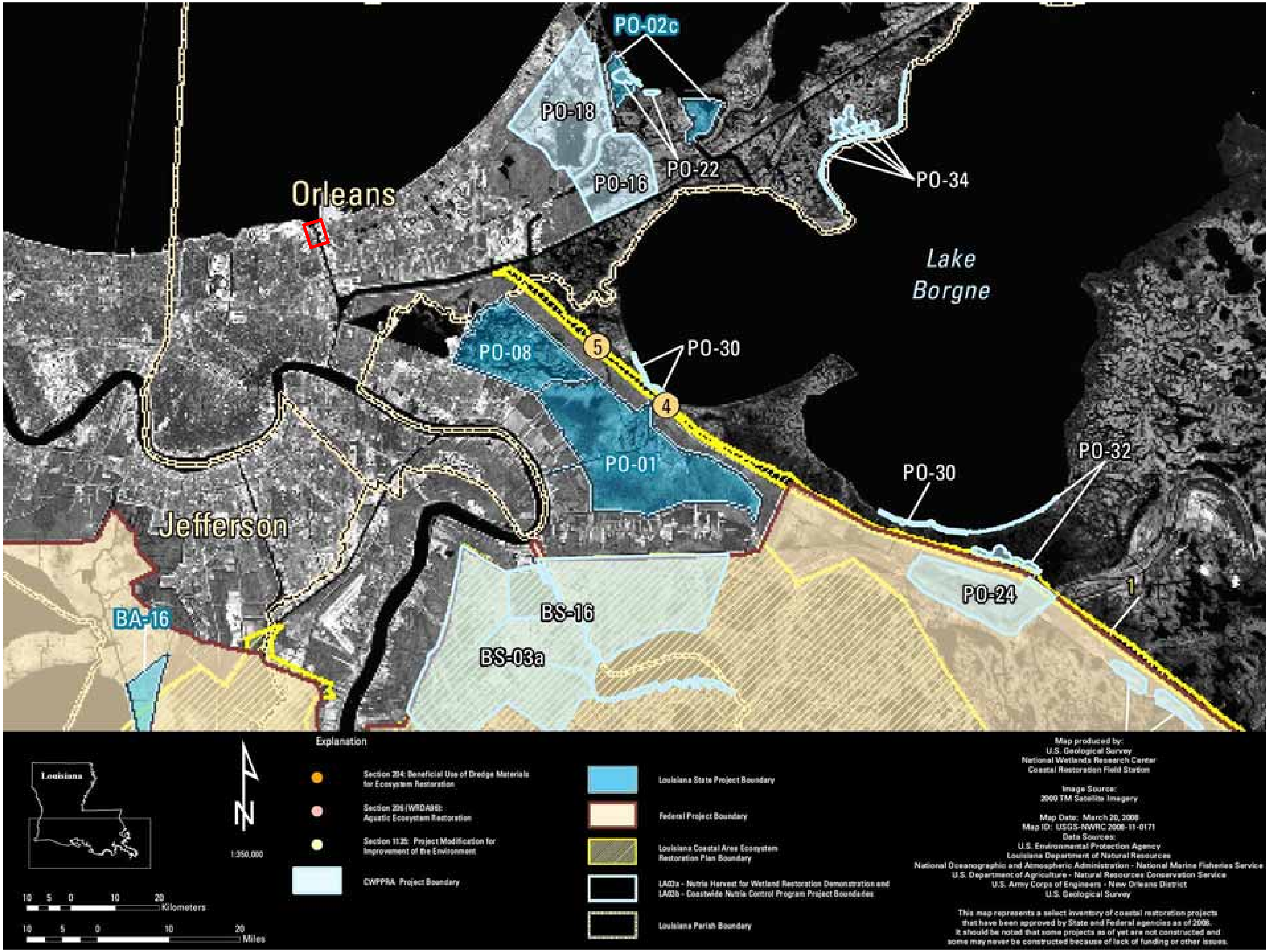


**Figure 45. CWPPRA Restoration, Stabilization, and Creation Projects Near the Tier 2 Pontchartrain Project Area**

**Table 16.**
**Selected CWPPRA Projects Near the Tier 2 Pontchartrain Project Area**

| State Number | PPL | Agency | Project Name | Project Area | AAHU | Acres Created/ Restored | Acres Protected | Total Net Acres | Construction Date | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| BA-16 | n/a | n/a | Bayou Segnette Shoreline Protection | n/a | n/a | n/a | n/a | n/a | n/a | Completed 1994 |
| BS-03a | 2 | NRCS | Caernarvon Diversion Outfall Management | 15,556 | 504 | 802 | 0 | 802 | 6/1/2001 | Complete |
| BS-16 | 17 | USFWS | Caernarvon Outfall Management/Lake Lery SR | 16,260 | 302 | 268 | 384 | 652 | n/a | n/a |
| **PO-01** | **n/a** | **n/a** | **Violet Siphon Freshwater Diversion** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **Completed 1992** |
| PO-02c | n/a | n/a | Bayou Chevee Shoreline Protection | n/a | n/a | n/a | n/a | n/a | n/a | Completed 1994 |
| **PO-08** | **n/a** | **n/a** | **Central Wetlands Pump Outfall – Freshwater Diversion** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **Completed 1992** |
| PO-16 | 1 | USFWS | Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase I | 3,800 | 520 | 1,050 | 500 | 1,550 | 6/1/1995 | Completed May 1996 |
| PO-18 | 2 | USFWS | Bayou Sauvage National Wildlife Refuge Hydrologic Restoration, Phase II | 5,475 | 584 | 7850 | 530 | 1,280 | 4/15/1996 | Completed May 1997 |
| PO-19 | 3 | USACE | MRGO) Disposal Area Marsh Protection | 855 | 435 | 0 | 755 | 755 | 1/25/1999 | Completed Jan. 1999 |
| PO-22 | 5 | USACE | Bayou Chevee Shoreline Protection | 212 | 42 | 0 | 75 | 75 | 8/25/2001 | Construction |
| PO-24 | 8 | NMFS | Hopedale Hydrologic Restoration | 3,805 | 269 | 0 | 134 | 134 | 1/10/2004 | Construction |
| **PO-30** | **10** | **EPA** | **Lake Borgne Shoreline Protection** | **192** | **61** | **0** | **165** | **165** | **8/1/2007** | **Construction** |
| PO-32 | 12 | USACE | Lake Borgne and MRGO Shoreline Protection | 465 | 70 | 17 | 249 | 266 | n/a | Engineering and Design |
| PO-34 | 16 | USACE | Alligator Bend Marsh Restoration and Shoreline Protection | 584 | 166 | 285 | 45 | 330 | n/a | n/a |
| | | | **Summary Acres for all approved projects (including those not shown):** | **1,488,841** | | **51,829** | **69,890** | **121,719** | | |

Notes:
= Projects within 10 miles of the IER #11 Tier 2 Pontchartrain Project Area
n/a = information not available
**Agency/Sponsor:** USEPA = Environmental Protection Agency; NMFS = National Marine Fisheries Service; NRCS = Natural Resources Conservation Service; USFWS = U.S. Fish and Wildlife Service; USACE = U.S. Army Corps of Engineers.
**PPL –** Priority Project List
**Project Area –** the benefitted area as determined by the Environmental Work Group for purposes of conducting Wetland Value Assessments.
**AAHU –** Average Annual Habitat Units as determined by the Environmental Work Group. Habitat Units represent a numerical combination of habitat quality (Habitat Suitability Index) and habitat quantity (acres) within a given area at a given point in time. Average Annual Habitat Units represent the average number of Habitat Units within any given area.
**Acres Created/Restored –** The acres of emergent marsh created or restored as a result of project implementation.
**Acres Protected –** The acres of emergent marsh protected from loss as a result of project implementation.
**Total Net Acres –** The net gain in emergent marsh as a result of project implementation as determined by the Environmental Work Group. This table includes acres of emergent marsh protected, created, and restored as a result of project implementation.

4.2.2.2 Mississippi River Gulf Outlet Deep-Draft Deauthorization (Closure of the MRGO at Bayou La Loutre)

The WRDA 07 provided for the deauthorization of the MRGO upon the submission of the USACE Chief's Report, Legislative EIS and signed Decision Record to Congress. On 5 June 2008, the Assistant Secretary of the Army for Civil Works forwarded said report, Legislative EIS, and Decision Record to Congress. The report recommended deauthorization of the MRGO and construction of a closure structure across the MRGO just south of Bayou La Loutre. Therefore, the MRGO Federal navigation channel from the south bank of the GIWW at Mile 60 to the Gulf of Mexico at Mile -9.4 is deauthorized, and a closure structure constructed at Bayou La Loutre was completed 9 July 2009.

The deauthorization, construction of the closure structure, and the impacts of such actions were disclosed in a final Legislative EIS (USACE 2007d). Habitat shifts caused by saline waters brought in by the MRGO might have caused the following changes in wetland types in the vicinity of the MRGO: the conversion of 3,350 acres of fresh/intermediate marsh and 8,000 acres of cypress swamp to brackish marsh and 19,170 acres of brackish march and swamp to saline marsh. Also, during the period 1964 to 1996, 5,324 acres of marsh were lost adjacent to the MRGO channel. The MRGO closure structure at La Loutre is expected to reduce salinity and erosion in those areas (USACE 2007d). Additionally, impacts associated with the action proposed for the IER #11 Tier 2 Borgne project, which is located near the IER #11 Tier 2 Pontchartrain project in the Gulf Intracoastal Waterway (GIWW), were described in the final IER #11 Tier 2 Borgne document (USACE 2008c). The cumulative impact of a closure on the IHNC as part of the storm surge barrier proposed in IER #11 Tier 2 Pontchartrain would be comparatively small. Shifts and changes in habitats occur naturally as part of the deltaic processes where land is built and then erodes as the river shifts course over thousands of years. Over time, species adapt and change behaviors with these shifting habitats. Thus, closure of the MRGO should have beneficial cumulative impacts to the estuarine waters, wetlands, fisheries, and EFH within the Lake Pontchartrain Basin and the Breton Sound Basin including those associated with the IER #11 Tier 2 Pontchartrain project area.

4.2.2.3 Coastal Impact Assistance Program

The Energy Policy Act of 2005 (PL 109-58) was signed into law by President Bush on August 8, 2005. Section 384 of the Act establishes the Coastal Impact Assistance Program (CIAP), which authorizes funds to be distributed to Outer Continental Shelf (OCS) oil and gas producing states to mitigate the impacts of OCS oil and gas activities. Pursuant to the Act, a producing state or coastal political subdivision can use all amounts received for projects and activities for the conservation, protection, or restoration of coastal areas, including wetlands and for mitigation of damage to fish, wildlife, or natural resources. Amounts awarded under the provisions of the act can also be used to develop comprehensive conservation management plans.

The State of Louisiana worked with the coastal parishes to prepare a draft Louisiana Coastal Impact Assistance Plan that identifies restoration, conservation, and infrastructure projects to be supported by the State and each coastal parish for the 4 years of CIAP funding. The plan was most recently authorized in November 2007 and is regularly amended and updated as needed. This plan includes projects for the enhanced management of Mississippi River water and sediment, protection and restoration of critical land bridges, barrier shoreline restoration and protection, interior shoreline protection, marsh creation with dredged material, and a coastal forest conservation initiative. This plan and management strategies it proposed would have beneficial cumulative impacts to the estuarine waters, wetlands, fisheries, and EFH within the Lake Pontchartrain Basin including those associated with the Tier 2 Pontchartrain project area. Table 17 provides information on CIAP funded projects in the area.

**Table 17.**
**Selected CIAP Projects near the IER #11 Tier 2 Pontchartrain Project Area**

| Project Name | State Project ID | Project Area (acres) | Benefit (acres) |
|---|---|---|---|
| Orleans Land Bridge Shoreline Protection and Marsh Creation | PO-36(EB) | 220 | 1400 |
| Violet Freshwater Diversion | PO-35(EB) | 49 | 14000 |
| Lake Lery Rim Re-Establishment and Marsh Creation | BS-17 | n/a (in design phase) | n/a |

4.2.2.4 State Coastal Planning and Restoration

The State of Louisiana has initiated a series of programs to offset the catastrophic loss of coastal wetlands. The Louisiana State and Local Coastal Resources Management Act was passed in 1978 to regulate the developmental activities that affect wetland loss. The resulting Louisiana Coastal Resources Program became a federally approved coastal zone management program in 1980. The Louisiana Legislature passed Act 6 in 1989 (R.S.49:213-214), and a subsequent constitutional amendment which created the Coastal Restoration Division within the LaDNR, as well as the Wetlands Conservation and Restoration Authority (Wetlands Authority).

In the First Extraordinary Session, 2005 of the Louisiana Legislature, which ended on 22 November 2005, Senate Bill No. 71 (Act No. 8) was passed, which provided for the new 16-member panel, called the Coastal Protection and Restoration Authority, which is a broader version of the previous board that was named the Wetlands Conservation and Restoration Authority (WCRA). In addition, Senate Bill No. 71 also provided for the establishment of the Coastal Protection and Restoration Fund, previously named the Wetlands Conservation and Restoration Fund. The Fund is used for coastal wetlands conservation, coastal restoration, hurricane and storm damage risk reduction, and infrastructure impacted by coastal wetland losses.

The Louisiana Coastal Protection and Restoration (LaCPR) Final Technical Report, a closely coordinated effort between the CEMVN and the OCPR, identifies risk reduction measures that can be integrated to form a system that would provide enhanced risk reduction to coastal communities and infrastructure, as well as for the restoration of coastal ecosystems. The report addresses the full range of flood control, coastal restoration, and HSDRRS measures available, including those needed to provide comprehensive Category 5-Hurricane protection. The analysis was performed and a technical document has been produced with recommendations related to enhanced hurricane risk reduction and the restoration of coastal ecosystems. As of September 2009, the technical document is undergoing review by the Assistant Secretary of the Army for Civil Works prior to submittal to Congress.

The LaDNR Office of Coastal Restoration and Management is responsible for the maintenance and protection of the state's coastal wetlands. The Coastal Restoration and Engineering Divisions are responsible for the construction of projects aimed at creating, protecting, and restoring the state's wetlands. These divisions are divided further and provide ongoing management and restoration of resources in the Louisiana coastal zone. The LaDNR is involved in several major programs that are working to save Louisiana’s coastal wetlands. These programs include the CWPPRA, Coast 2050, the Louisiana Coastal Area (LCA) Ecosystem Restoration Plan, and the Coastal Impact Assistance Plan of 2005. Other programs include state restoration projects, Parish Coastal Wetlands Restoration Program, Vegetation Plantings, Section 204/1135, and WRDA.

The LCA Ecosystem Restoration Study (USACE and State of Louisiana 2004a) is a comprehensive report that identified the most critical human and natural ecological needs of the coastal area. The study presented and evaluated conceptual alternatives for meeting the most critical needs; identified the kinds of restoration features that could be implemented in the near-term (within 5 years to 10 years) that address the most critical needs, and proposed to address these needs through features that would provide the highest return in net benefits per dollar of cost. The study also established priorities among the identified near-term restoration features, described a process by which the identified priority near-term restoration features could be developed, approved, and implemented, identified the key scientific uncertainties and engineering challenges facing the effort to protect and restore the ecosystem, and proposed a strategy for resolving them. The study also identified, assessed and recommended feasibility studies that should be undertaken within the next 5 years to 10 years to fully explore other potentially promising large-scale and long-term restoration concepts. The study concluded by presenting a strategy for addressing the long-term needs of coastal Louisiana restoration beyond the near-term focus of the LCA Plan. The 2007 WRDA authorized approximately $1.9 billion for the USACE to carry out the LCA restoration program. The CEMVN has signed an agreement with the State of Louisiana to begin studies on the first six LCA projects, with study completion by December 2010.

Two components of the LCA Ecosystem Restoration Program "near-term plan" are located within the IER #11 Tier 2 Pontchartrain project vicinity. The Modification of Caernarvon Diversion project is located southwest of the project area. It includes the modification of the CFDC to allow an increase in the freshwater introduction rate in order to increase wetland creation and restoration outputs for the structure. This change in operation of the CFDC will accommodate the wetland building function of the system by facilitating organic and sediment deposition, improving biological productivity, and preventing further deterioration of the marshes (USACE and State of Louisiana 2004b). The second project, MRGO Ecosystem Restoration Plan, will address the comprehensive restoration and maintenance of estuarine habitat areas affected by the MRGO navigation channel. Potential features of the plan include wetland protection, restoration, and creation; shoreline protection; barrier island restoration and protection; and freshwater, sediment, and nutrient introduction from the Mississippi River (USACE 2009f).

#### 4.2.2.5 Violet Freshwater Diversion Project

Another restoration project that could influence the IER #11 Tier 2 Pontchartrain project area is the recently authorized Violet Diversion. Authorized under the provisions of the WRDA, the Violet Diversion would divert freshwater from the Mississippi River east across the wetland areas from the Mississippi River to Lake Borgne. The purpose of this diversion is to reduce the salinity in the western Mississippi Sound by diverting freshwater from the Mississippi River to the Biloxi Marshes and Lake Borgne. This diversion project could greatly increase fine sediment transport and deposition into the marshes located between the Mississippi River and the MRGO. It is unlikely that sediments would be transported across the MRGO into Lake Borgne and the Biloxi Marshes because the deep water MRGO would trap most of these sediments.

#### 4.2.2.6 Miscellaneous Wetland Restoration Projects

The New Orleans Sewerage and Water Board is pursuing a feasibility study to evaluate the potential discharge of treated effluent from the East Bank Sewer Treatment Plant (EBSTP), located off Florida Avenue and Dubreuil Street in the Ninth Ward Basin, into wetlands to provide water quality improvement, solids handling, hazard mitigation, and coastal wetland restoration.

### 4.2.3 Other Projects

The East Jefferson Levee District is placing more than 1,000-3-ton highway traffic barriers along the Lake Pontchartrain shoreline to help slow the rate of erosion in East Jefferson Parish. The Southeast Louisiana Flood Protection Authority-East is considering constructing a new breakwater along portions of the IER #3 project area. Over 100,000 tons of rock would be used, primarily along Reach 1 (the Recurve I-wall in Northwest Kenner to the Duncan Pumping Station) and Reach 4 (Suburban Canal to Bonnabel Canal), with another 8,000 tons of rock placed along the remaining reaches of the IER #3 project area. The Greater New Orleans Expressway Commission (GNOEC) is considering improvements to the Causeway near the USACE HSDRRS project at the Causeway. These improvements could include roadway modification to maintain the new proposed ramp height of 16.5 ft from the HSDRRS levee out onto the Causeway itself as well as additional roadway modifications. Although these projects could contribute to adverse impacts for some of the resources, several of them would have long-term positive impacts, including improved hurricane, storm, and flood damage risk reduction.

## 4.3 SUMMARY OF CUMULATIVE IMPACTS

The magnitude and significance of cumulative impacts were evaluated by comparing the existing environment with the expected impacts of the proposed action when combined with the impacts of other proximate actions. Projects that occur within the greater New Orleans area, within the Lake Pontchartrain Basin, and within the designated coastal zone for Louisiana were considered collectively (as appropriate) for the evaluation of cumulative impacts.

The majority of the HSDRRS projects are currently in the construction, planning, and design stages, and impacts from these component projects will be addressed in separate IERs and the CED. Construction of levees, gates, floodwalls, and onshore breakwaters throughout the region could cause direct and indirect wetland (including open water) and upland habitat loss. Construction damage as part of the 100-year HSDRRS projects to quality wetland habitats would be avoided to the maximum extent practicable, minimized if unavoidable, and fully mitigated through formal mitigation planning. The closing of the MRGO with a plug at Bayou La Loutre reduces the intrusion of higher salinity waters into Lake Pontchartrain via the IHNC, which has impacted the habitat of Lake Pontchartrain and adjacent wetlands. Barriers at La Loutre, Lake Borgne, and the IHNC would reduce storm surge inundation impacts for low-lying areas on the protected side of the HSDRRS. Depending on design and maintenance, shoreline stabilization measures could alter existing shoreline habitat and block access of aquatic organisms to interior wetlands.

Potential cumulative impacts to hydrology, water quality, aquatic resources, fisheries, and EFH in the project vicinity could occur from construction-related activities (e.g., turbidity from dredging, noise) and from other on-going, completed, and authorized projects in the area (e.g., changes in salinity, velocity, and circulation/flow). The proposed action will have additive positive and negative impacts to identified recent and future projects such as closure of the MRGO at Bayou La Loutre and the Borgne Barrier. Fishing and boating access in the area will be impacted by the construction of all closure structures, but particularly during the 6 months to 12 months of cofferdam placement for the proposed action since Seabrook is a popular fishing passage. The aquatic community would also experience localized water quality degradation, i.e. smothering, increased turbidity, low DO events, during the construction period, with subsequent negative effects on fishing activity. Reduced transport of larval organisms from the Gulf into Lake Pontchartrain may cause slight reductions, over the long-term, of aquatic organisms including sport fish and their prey.

Although the project area has already been altered by construction and maintenance of navigable waterways (GIWW, IHNC, and MRGO) and the existing HSDRRS, the proposed action would contribute to changes both beneficial (improving salinity, DO conditions in some areas) and negative (temporary and permanent decrease in dispersion of organisms) to fisheries resources, including prey species.

ADH modeling has shown that closing the MRGO at La Loutre creates large changes to circulation patterns, water surface elevations and velocities within the Lake Pontchartrain Basin. These parameters would continue to change with the implementation of the Borgne Barrier and the proposed action. The ADH model results predict a clear change in circulation patterns once the MRGO is cut off from the Gulf of Mexico. Before the closure structure at La Loutre, flow moves up the MRGO and splits at the GIWW, with a portion moving west and up the IHNC and a portion moving east down the GIWW; however, once the closure is in place, the tide cannot move up the MRGO as previously done. Water can only enter the GIWW at its connections at Lake Borgne. Flow does move through Bayou Bienvenue, but the amount of water it transports is much less than the flows that move up the MRGO or enter through Lake Borgne, and it has little effect on the overall circulation pattern through the GIWW. These changes show a clear direction of flow along the GIWW as opposed to a direction that may vary at times. Changes in water surface elevations are most noticeable at the MRGO closure at Bayou La Loutre according to the ADH model simulations. North of the closure, a 2.5 hour lag in tidal phasing is predicted. With the implementation of the Borgne Barrier and the proposed action, the elevation ranges continue to drop; however, these differences are less extreme.

Velocity modeling results were reported in positive and negative numbers to demonstrate flood and ebb tidal movement. Positive velocity numbers represent directional flow to the north or east and negative numbers represent directional flow to the south and west. Modeled data for plan 1 predict average velocities in the IHNC of 1.59 fps and -1.57 fps in September along with 1.87 fps and -1.68 fps in March (USACE 2009c). With the addition of the Borgne Barrier (plan 2), modeled data predicts a decrease in average velocities in the IHNC. Under plan 3 final (proposed action), velocities are expected to increase during March and September conditions. Average velocities during March would increase to 2.63 fps and -2.33 fps and the average velocity during September would increase to 2.24 fps and - 2.13 fps.

Concurrent construction of 100-year HSDRRS projects could cause short-term impacts to water quality that may exceed the LaDEQ water quality standards. Although the proposed action, when combined with the closure structures along the GIWW and Bayou Bienvenue indicate changes in DO and salinity values, the changes described would be minimal compared to the shift that would occur due to the MRGO closure at Bayou La Loutre. Modeling conducted by ERDC illustrated that the closure of the MRGO at Bayou La Loutre had a significant effect on monthly average bottom salinity values not only in the MRGO/GIWW/IHNC complex, but also in the Lake Pontchartrain area. Most areas are expected to show decreases of 3 ppt to 4 ppt, with the MRGO channel showing the highest decrease in the region just north of the La Loutre closure at approximately 10 ppt (USACE 2009d).

The overall change to salinity could be both positive and negative to aquatic resources, fisheries, and EFH. It is expected that environmental conditions would become fresher, and closer to historical salinity conditions. Reductions in salinity would impact the existing system in the short-term by creating localized community and habitat shifts, a disconnection between predators and prey species, changes in behavior, decreased growth rates, and shifts in populations of some species. The initial reductions in salinity may cause adverse short-term effects. However, over the long term, salinities in Lake Pontchartrain near the project would be slightly lowered to levels that are closer to historical salinities typically experienced by aquatic organisms in the area.

Dispersion of all life stages of aquatic resources and fisheries would experience an additive effect from the MRGO closure at La Loutre, the Borgne Barrier, and the proposed action.

Organisms would be unable to use the MGRO and access through the Golden Triangle marsh would be restricted to a small opening at Bayou Bienvenue for transport or migration to Lake Pontchartrain; however, the IHNC via the GIWW (except for approximately 6 months to 12 months of cofferdam placement during construction of the proposed action) and two passes in the eastern portion of the lake would be available. While organisms could see a benefit from the overall change in flow direction from the implementation of MRGO closure structure, the Borgne Barrier, and the proposed action, recruitment of larvae and other life stages into Lake Pontchartrain after construction of these closures would be decreased.

For approximately 6 months to 12 months during construction, a cofferdam would block flow between the IHNC and Lake Pontchartrain, potentially causing an increase in predation of some lower trophic level species. This blockage along with the Borgne Barrier and the MRGO closure at La Loutre may require larvae and predators to travel longer distances, thereby extending an already lengthy trip and possibly decreasing growth rates, overall health, and the ability for some individuals to reproduce.

Fish kills in Lake Pontchartrain coupled with potential fish kills at the Bienvenue closure and the IHNC would impact a large number of individuals. Fish kills could cause slower growth rates in individuals subjected to this environment, and would decrease survival of some species causing changes in overall community structure near the closures. Greater impacts are expected due to the MRGO closures (due to the higher salinities and deeper water depth in the area) as compared to the proposed action.

Cumulative adverse impacts to human populations within the study area are not expected to be permanent; however, there would be temporary adverse impacts from the increased traffic, detours, road closures, and noise associated with construction activities that could occur 24 hours a day, 7 days a week for approximately 36 months. Construction of these projects could cause temporary and localized decreases in air quality that would mainly result from the emissions of construction equipment during dredging and construction. However, these changes in air quality should return to pre-construction conditions shortly after construction completion and these changes in air quality are not expected to change the area's attainment status. The proposed action in conjunction with other actions in the region would not contribute to cumulative impacts from HTRW.

The cumulative effects of the many projects in the area could provide long-term and sustainable beneficial impacts to the communities within the study area by reducing the risk of damage within flood-prone areas and by generating economic growth. Economic growth could attract displaced residents and new workers and encourage repopulation within the New Orleans Metropolitan area. Although a few businesses would be negatively impacted during construction, the proposed action would have cumulative beneficial impacts to socioeconomic resources in the New Orleans Metropolitan Area. It is part of the ongoing Federal effort to reduce the threat to life, health, and property posed by flooding. The LPV HSDRRS project would provide additional HSDRRS, reducing the threat of inundation of infrastructure due to severe tropical storm events. The combined effects from construction of the multiple projects underway and rebuilding the HSDRRS in the area would reduce flood risk and storm damage to residences, businesses, and other infrastructure from storm-induced and tidally-driven flood events and, thereby, would encourage recovery. Providing 100-year level of risk reduction within all reaches of the LPV allows for FEMA certification of that level of risk reduction. Improved HSDRRS would benefit all residents, regardless of income or race, increase confidence, reduce insurance rates, and allow for development and redevelopment of existing urban areas.

In conclusion, although there are many ongoing and authorized projects that would similarly impact resources in the Lake Pontchartrain Basin portion of Louisiana, most of the resulting impacts would be temporary. Cumulative impacts to social and economic resources would not only be beneficial, but are considered essential.

# 5.0 SELECTION RATIONALE

The USACE established the Alternative Evaluation Process (AEP), a logical, systematic process for recommending a proposed action alternative. The AEP is utilized throughout the HSDRRS to promote a consistent method of selecting a proposed action, across the system. The AEP for IER #11 Tier 2 Pontchartrain was conducted in two phases. The first phase evaluated four alternatives before identifying one as the proposed action. Subsequently, it was determined during the hydraulic analysis process that the size of the navigation opening designated for the proposed action was not adequate to pass the required flow without exceeding the acceptable flow velocities. Project evaluation was re-initiated to address the need for a larger opening and different gate configurations that would allow the flow to pass through at velocities that are acceptable for navigation and human and natural environmental factors. During this second phase, four alternatives were evaluated, including two modified versions of the proposed action selected during the first phase (the final proposed action and alternative #2); both of these options included lift gates in addition to the original sector gate to increase the flow through area and reduce the flow velocities to an acceptable range. The alternative selected as the proposed action during the second phase of the AEP was a modified version of the alignment selected during the first phase.

The proposed action (alternative #1) was selected to balance the necessity for better reduction of risk to life and property from hurricane and storm related flooding with engineering costs, feasibility, practicality, and impacts to the human and natural environment. Most of the adverse resource impacts expected would be short-term and would occur only during construction. Some permanent impacts to open water and waterbottoms would occur from permanent placement of in-channel structures and associated scour protection and from filling the existing scour hole. These resource impacts were considered along with AEP factors or practicality criteria that included risk and reliability, constructability, real estate requirements, OMRR&R, schedule, and cost.

The risk and reliability associated with the various alternatives are similar; however, for some factors considered for this criterion (i.e., storm load exposure, inspections and maintenance, quality control and exposure during the construction period) there were some subtle differentiations. The proposed action and alternative #2 are preferable over alternatives #3 and #4 for these factors primarily because of the greater length of the floodwall in both alternatives #3 and #4. The proposed action and alternative #2 are preferable over alternative #5 primarily because of the extreme conditions associated with being in the lake versus the IHNC and other impacts associated with the length of floodwall over water in alternative #5, especially during construction. Due to the location of alternative #5 in the lake, this alternative would offer the greatest level of protection to the widest range of properties along the IHNC. The proposed action and alternative #2 alignments would provide an increased level of risk reduction to a majority of Seabrook properties; however, slightly less due to their location further south in the IHNC compared to alternative #5. Alternatives #3 and #4 would potentially allow the greatest amount of storm surge to enter the IHNC due to their southern alignments and therefore have more risk associated with them compared to alternatives #1, #2, and #5.

For the constructability criterion, the proposed action and alternative #2 are preferable over alternatives #3 and #5 primarily because of the difficulty associated with construction over water (i.e., alternatives #3 and #5 have long segments of floodwalls in the IHNC and in Lake Pontchartrain, respectively). The construction duration of alternative #5 would be approximately

9 months longer than that of alternatives #1 through #4, further prolonging the establishment of 100-year level of protection to the Seabrook area. The constructability of the proposed action and alternative #2 is favorable over alternative #4 because of significant underground utility conflicts on the eastern end of alternative #4. The construction period for the proposed action would be shorter than that for alternatives #2 through #5. Although alternative #5 would be more favorable for navigation compared to alternatives #1 through #4 because limited navigation could be maintained through the Seabrook Pass during construction, it would result in greater long-term negative impacts to the environment (aquatics and Threatened and Endangered Species) than the other alternatives considered. Costs for alternatives #3 and #4 would be significantly higher than for the proposed action or alternative #2, primarily because of the additional cost associated with replacing the I-walls connecting the gate alignments with LPVs 104 and 105 with T-walls. O&M costs for alternative #5 would be higher because a large portion of the work would be done from a barge.

Between the proposed action and alternative #2, which were rated similarly for most criteria, the proposed action, which is farther from the railroad bridge, would have less long-term impact on the railroad bridge piers. Based on a comparison of the results of the criteria evaluation, the proposed action was selected. The proposed action is compatible and works in concert with other projects that have been completed, are in progress, or have been authorized to improve the risk reduction provided by the HSDRRS.

# 6.0 COORDINATION AND CONSULTATION

## 6.1 PUBLIC INVOLVEMENT

Extensive public input has been sought in preparing this report. The proposed action analyzed in this IER was publicly disclosed and described in the Federal Register on 13 March 2007 and on the website www.nolaenvironmental.gov. Scoping for this project was initiated on 12 March 2007 through placing advertisements and public notices in *USA Today* and *The New Orleans Times-Picayune*. Nine public scoping meetings were held throughout the New Orleans Metropolitan area to explain scope and process of the Alternative Arrangements for implementing NEPA between 27 March and 12 April 2007, after which a 30-day scoping period was open for public comment submission. Additionally, the CEMVN is hosting monthly public meetings to keep the stakeholders advised of project status. The public is able to provide verbal comments during the meetings and written comments after each meeting in person, by mail, and via www.nolaenvironmental.gov.

Public meetings were held in March 2007 through January 2008 regarding improved risk reduction specific to the draft IER #11 (Tier 1 document), which detailed the impacts from the proposed actions. The draft IER #11 Tier 1 document was released for public review on 31 January 2008 and stakeholders had until 29 February 2008 to comment on the document. Comments were received from governmental agencies, non-governmental organizations, and citizens. The Decision Record for the Tier 1 document was signed on 14 March 2008.

Public meetings were held between 17 April and 29 July 2008 regarding improved risk reduction specific to the draft IER #11 Tier 2 Borgne document which detailed the impacts from proposed actions in the GIWW, MRGO, and Bayou Bienvenue near Lake Borgne. The draft IER #11 Tier 2 Borgne document was released for public review on 20 August 2008 and stakeholders had until 18 September 2008 to comment on the document. Comments were received from governmental agencies, non-governmental organizations, and citizens. The Decision Record for the Tier 2 Borgne document was signed on 21 October 2008.

Public meetings were held 10 January 2009, 3 March 2009, 5 March 2009, and 27 October 2009 regarding improved risk reduction on the IHNC and this draft IER #11 Tier 2 Pontchartrain document.

This draft IER #11 Tier 2 Pontchartrain document will be distributed for a 30-day public review and comment period. A public meeting specific to the proposed action will be held if requested by a stakeholder during the review period. Any comments received during this public meeting will be considered part of the official record. After the 30-day comment period, and public meeting if requested, the CEMVN District Commander will review all comments received during the review period and make a determination if they rise to the level of being substantive in nature. If comments are not considered to be substantive, the District Commander will make a decision on the proposed action. This decision will be documented in an IER Decision Record. If a comment(s) is determined to be substantive in nature, an Addendum to the IER will be prepared and published for an additional 30-day public review and comment period. After the expiration of the public comment period the District Commander will make a decision on the proposed action. The decision will be documented in an IER Decision Record.

## 6.2 AGENCY COORDINATION

Preparation of this IER has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. An interagency environmental team was established for this project in which Federal and state agency staff played an integral part in the project planning and alternative analysis phases of the project (members of this team are listed in appendix C). This interagency environmental team was integrated with the CEMVN PDT to assist in the planning of this project and to complete a mitigation determination of the potential direct and indirect impacts of the proposed action. Monthly meetings with resource agencies were also held concerning this and other IER projects. The following agencies, as well as other interested parties, are receiving copies of this draft IER:

U.S. Coast Guard
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, NOAA National Marine Fisheries Service
U.S. Natural Resources Conservation Service
Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality
Louisiana State Historic Preservation Officer
Orleans Levee District
Coastal Protection and Restoration Authority of Louisiana

The USCG provided input during the early stages of project planning on 13 February 2009. The USCG would likely determine that the proposed action would impair their ability to quickly and effectively respond to emergency situations, and would likely determine that the proposed action would result in a Hazard to Navigation (during construction).

The Orleans Levee District provided input on the project during a meeting held 20 February 2009. The Levee District did not envision that the project would adversely affect their plans to replace bumper and dolphin structures on the north side of the Seabrook pass. The Levee District did not believe the proposed action would adversely affect their Marina operations with the exception of impacts to a limited number of their customers who operate large sailboats with masts higher than 50 ft, which exceeds the maximum height of the pass under the twin spans at I-10 at the Rigolets, the alternate route to Lake Pontchartrain when Seabrook is closed during construction.

The USFWS reviewed the proposed action to determine if it would affect any threatened or endangered species or critical habitat under their jurisdiction. The USFWS concurred with the CEMVN in a letter dated 2 February 2009, that the proposed action would not have adverse impacts on threatened or endangered species (appendix E).

The NMFS reviewed the proposed action to see if it would affect any threatened or endangered species or critical habitat under their jurisdiction. The NMFS concurred with the CEMVN in a letter dated 31 August 2009 that the proposed action would not have adverse impacts on threatened or endangered species or their critical habitat (appendix E).

The LaDNR reviewed the proposed action for consistency with the Louisiana Coastal Resources Program (LaCRP). The proposed action was found to be consistent with the LaCRP, as per a letter dated 9 November 2009 (appendix E).

The application for water quality certification (WQC 080616-01/AI 158513/CER 20080001) for the proposed action has been sent to LaDEQ, and a public notice has been placed in the Times-Picayune of New Orleans and The Advocate of Baton Rouge. The Decision Record for this IER will not be signed by the Commander until WQC has been received from LaDEQ.

Section 106 of the National Historic Preservation Act, as amended, requires consultation with the Louisiana SHPO and Native American tribes. Eleven federally recognized tribes that have an interest in the region were given the opportunity to review the proposed action. The SHPO concurred with the CEMVN's "no adverse effect" finding in a letter dated 20 February 2009. The Choctaw Nation of Oklahoma and the Alabama-Coushatta Tribe of Texas concurred with the CEMVN's effect determination in letters dated 19 February 2009 and 3 March 2009, respectively. No other Indian Tribes responded to the request for comments.

The CEMVN formally initiated Section 106 consultation for the LPV Hurricane Risk Reduction Project (100-year), which includes IER #11, in a letter dated 9 April 2007. SHPO staff and Tribal governments met with the CEMVN to discuss the development of a PA [Programmatic Agreement] to tailor the Section 106 consultation process under the Alternative Arrangements for implementing NEPA. A public meeting was held on 18 July 2007, to discuss the working draft PA. It is anticipated that the PA would be executed in the near future.

Coordination with the USFWS on the Alternative Arrangements process was initiated by letter on 13 March 2007, and concluded on 6 August 2007. The CEMVN received a draft programmatic Coordination Act Report (CAR) from the USFWS on 26 November 2007. A draft CAR was provided by the USFWS on 23 October 2009 for IER #11 Tier 2 Pontchartrain. This report's recommendations are addressed below. The draft programmatic CAR and draft CAR specific to the Tier 2 Pontchartrain project provide fish and wildlife conservation recommendations that would be implemented concurrently with project implementation. In addition, as discussed previously in section 3.2.7, measures recommended by the USFWS in their letter dated 22 February 2008, for protection of the manatee would be followed during construction of the proposed action. A copy of the draft CAR for IER #11 Tier 2 Pontchartrain is provided in appendix E.

The USFWS' programmatic recommendations applicable to this project will be incorporated into project design studies to the extent practicable, consistent with engineering and public safety requirements.  The USFWS' programmatic recommendations, and the CEMVN's response to them, are listed below:

Programmatic Recommendation 1:  To the greatest extent possible, situate flood protection features so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.
CEMVN Programmatic Response 1:  Not applicable; there are no wetlands or bottomland hardwoods within the project area.

Programmatic Recommendation 2:  Minimize enclosure of wetlands with new levee alignments.  When enclosing wetlands is unavoidable, acquire non-development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

CEMVN Programmatic Response 2:  Not applicable.

Programmatic Recommendation 3:  Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction.

CEMVN Programmatic Response 3:  Concur.  No bald eagle nests or wading bird colonies have been recorded in or near the project area, and suitable habitat for nesting of these species does not occur in the vicinity.

Programmatic Recommendation 4:  Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

CEMVN Programmatic Response 4:  No forest clearing would occur with implementation of the proposed action.

Programmatic Recommendation 5:  The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features.

CEMVN Programmatic Response 5:  USACE Project Partnering Agreements (PPA) do not contain language mandating the availability of funds for specific project features, but require the non-Federal Sponsor to provide certification of sufficient funding for the entire project. Further, mitigation components are considered a feature of the entire project.  The non-Federal Sponsor is responsible for OMRR&R of all project features in accordance with the OMRR&R manual that the Corps provides upon completion of the project.

Programmatic Recommendation 6:  Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the USFWS, NMFS, LaDWF, USEPA, and LaDNR.  The USFWS shall be provided an opportunity to review and submit recommendations on all the work addressed in those reports.

CEMVN Programmatic Response 6: Concur.

Programmatic Recommendation 7:  The CEMVN should avoid impacts to public lands, if feasible.  If not feasible, the CEMVN should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance.  Points of contacts for the agencies overseeing public lands potentially impacted by project features are:  Kenneth

Litzenberger, Project Leader for the USFWS' Southeast National Wildlife Refuges, and Jack Bohannan (985) 822-2000, Refuge Manager for the Bayou Sauvage National Wildlife Refuge (NWR), Office of State Parks contact Mr. John Lavin at 1-888-677-1400, National Park Service (NPS) contact Superintendent David Luchsinger, (504) 589-3882, extension 137 (david_luchsinger@nps.gov), or Chief of Resource Management David Muth (504) 589-3882, extension 128 (david_muth@nps.gov) and for the 404(c) area contact the previously mentioned NPS personnel and Ms. Barbara Keeler (214) 665-6698 with the USEPA.

CEMVN Programmatic Response 7: Concur.

Programmatic Recommendation 8: If applicable, a General Plan should be developed by the CEMVN, the USFWS, and the managing natural resource agency in accordance with Section 3(b) of the USFWS CAR for mitigation lands.

CEMVN Programmatic Response 8: Concur, to the extent allowed by law.

Programmatic Recommendation 9: If mitigation lands are purchased for inclusion within a NWR, those lands must meet certain requirements; a summary of some of those requirements is provided in appendix A (to the draft USFWS CAR). Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore, if they are proposed as a manager of a mitigation site, they should be contacted early in the planning phase regarding such requirements.

CEMVN Programmatic Response 9: Concur.

Programmatic Recommendation 10: If a proposed action feature is changed significantly or is not implemented within one year of the date of the Endangered Species Act consultation letter, the USFWS recommended that the Corps reinitiate coordination to ensure that the proposed action would not adversely affect any federally listed threatened or endangered species or their habitat.

CEMVN Programmatic Response 10: Concur.

Programmatic Recommendation 11: In general, larger and more numerous openings in a protection levee better maintain estuarine-dependent fishery migration. Therefore, as many openings as practicable, in number, size, and diversity of locations should be incorporated into project levees.

CEMVN Programmatic Response 11: This recommendation will be considered in the design of the project to the greatest extent practicable. Modeling indicated that three openings (gates) are necessary to maintain velocities similar to historic conditions.

Programmatic Recommendation 12: Flood protection water control structures in any watercourse should maintain pre-project cross-sections in width and depth to the maximum extent practicable, especially structures located in tidal passes.

CEMVN Programmatic Response 12: Although the pre-project cross-sectional area for flow (5,250 sq ft) will be reduced to 3,510 sq ft with the proposed structure, the structure will be designed to maintain approximately the historic velocities through this area, and to minimize turbulence.

Programmatic Recommendation 13: Flood protection water control structures should remain completely open except during storm events. Management of those structures should be developed in coordination with the USFWS, NMFS, LaDWF, and LaDNR.

CEMVN Programmatic Response 13: Concur. The structure would remain open except during storm events, high flow events, and maintenance activities. Management plans for the structures would be developed with the non-Federal sponsor in coordination with the USFWS, NMFS, LaDWF, and LaDNR.

Programmatic Recommendation 14: Any HSDRRS water control structure sited in canals, bayous, or a navigation channel which does not maintain the pre-project cross-section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.

CEMVN Programmatic Response 14: The gate design includes three openings that span the majority of the channel.

Programmatic Recommendation 15: The number and siting of openings in HSDRRS levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.

CEMVN Programmatic Response 15: Not applicable. With the exception of the construction of the new sector gate within the IHNC, no new barriers to wetlands would be constructed.

Programmatic Recommendation 16: HSDRRS structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

CEMVN Programmatic Response 16: This recommendation will be considered in the design of the project to the greatest extent practicable.

Programmatic Recommendation 17: To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 fps. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.

CEMVN Programmatic Response 17: The IHNC is a major exchange point in which velocities of ebb tides already exceed 2.6 fps. The structure will be designed to maintain approximately the historic velocities through this area.

Programmatic Recommendation 18: To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts selected should maintain sufficient flow to prevent siltation

CEMVN Programmatic Response 18: Acknowledged.

Programmatic Recommendation 19: Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one 24-inch culvert placed every 500 ft and one at natural stream crossings. If the depth of water crossings allow, larger-sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500 ft long and an area would hydrologically be isolated without that culvert.

CEMVN Programmatic Response 19: Not applicable.

Programmatic Recommendation 20: Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

CEMVN Programmatic Response 20: Concur. The gates are designed to allow rapid opening in absence of an offsite power source.

Programmatic Recommendation 21: Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.

CEMVN Programmatic Response 21: Concur.

Programmatic Recommendation 22: Operational plans for water control structures should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

CEMVN Programmatic Response 22: See CEMVN Response to Recommendation 13.

Programmatic Recommendation 23: The CEMVN shall fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

CEMVN Programmatic Response 23: Concur.

Programmatic Recommendation 24: Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the CEMVN shall provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

CEMVN Programmatic Response 24: Concur.

Programmatic Recommendation 25: Any proposed change in mitigation features or plans should be coordinated in advance with the USFWS, NMFS, LaDWF, USEPA, and LaDNR.

CEMVN Programmatic Response 25: Not applicable, no mitigation would be required for the proposed action.

Programmatic Recommendation 26: A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the CEMVN, USFWS, NMFS, USEPA, LaDNR, and LaDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

CEMVN Programmatic Response 26: Concur.

A draft CAR for IER #11 Tier 2 Pontchartrain was provided by the USFWS on 23 October 2009. The draft CAR concluded that the USFWS does not object to the construction of the proposed project provided that fish and wildlife conservation recommendations are implemented concurrently with project implementation. The USFWS project-specific recommendations for the IER #11 Tier 2 Pontchartrain proposed action are listed below. Each recommendation is followed by the CEMVN response.

Recommendation 1: Generally, flood protection barriers and associated structures should be situated so that destruction and enclosure of emergent wetlands are avoided or minimized, to the greatest extent possible.

CEMVN Response 1: Not applicable; wetland habitat does not exist in the vicinity of the proposed action.

Recommendation 2: The project's first Project Cooperation Agreement (or similar document) should include language that specifies the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features, as well as shoreline protection features.

CEMVN Response 2: See CEMVN Programmatic Response 5.

Recommendation 3: Further detailed planning and design of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LaDWF, USEPA, and LaDNR. The Service shall be provided an opportunity to review and submit recommendations on the all work addressed in those reports.

CEMVN Response 3: Concur. The Service will be provided such an opportunity.

Recommendation 4: If a proposed project feature is changed significantly or is not implemented within one year of the date of our 2 February 2009 (incorrectly dated 30 January 2007), Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with each office (i.e., NMFS in St. Petersburg, Florida, and the Service's Lafayette, Louisiana, Field Office) to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

CEMVN Response 4: Concur.

Recommendation 5: Operation and maintenance plans should inform the local sponsor of the potential for federally listed threatened and endangered species to occur near the proposed structures and the need be aware of their presence during operation of those structures. We recommend that the Corps' include in the operation and maintenance plan provided to the local sponsor a measure that will inform them of the need to coordinate with the Service and NMFS every year and when operational plans are revised, as those revisions may affect federally listed threatened and endangered species.

CEMVN Response 5: Concur.

Recommendation 6: To ensure manatees are not entrained within the flood protection structures or harmed during the closure of the structures, Standard Manatee Protection Measures should be included in the Corp's construction contracts as well as the operation and maintenance plans developed for the local sponsor.

CEMVN Response 6: Concur.

Recommendation 7: Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.

CEMVN Response 7: Acknowledged. See CEMVN Programmatic Response 12.

Recommendation 8: Flood protection water control structures should remain completely open except during storm events and should be operated to allow for maximum flow. The development of the operation and maintenance plans should be closely coordinated with the natural resource agencies to ensure maintenance events are scheduled to minimize impacts to aquatic resources.

CEMVN Response 8: Acknowledged. Apart from possible closure for adverse flow conditions, the Seabrook structure will be closed in a storm event or for maintenance and operation conditions. Exact details on frequency of such events and duration are currently being established but preliminary estimates provided in section 1.6, Data Gaps.

Recommendation 9: To the maximum extent practicable, monthly maintenance activities should coincide with closure events intended to reduce velocities for the maritime industry. In the event this is not feasible, closures should be timed during the two low periods of the tidal range during a month to minimize impacts to fisheries migration and flow.

CEMVN Response 9: Acknowledged.

Recommendation 10: Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

CEMVN Response 10: This recommendation will be considered in the design of the project to the greatest extent practicable.

Recommendation 11: To the maximum extent practicable, structures should be designed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 fps. This may not necessarily be applicable to tidal passes or other similar major exchange points.

CEMVN Response 11: The IHNC is a major exchange point in which velocities of ebb tides already exceed 2.6 fps. The structure will be designed to maintain approximately the historic velocities through this area.

Recommendation 12: Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

CEMVN Response 12: Concur. The gates are designed to allow rapid opening in absence of an offsite power source.

Recommendation 13: Operation and maintenance plans should be developed to maximize the cross-sectional area open for as long as possible and should be coordinated with the natural resource agencies. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

CEMVN Response 13: Management plans for the structures will be developed with the non-federal sponsor in coordination with USFWS, NMFS, LaDWF, and LaDNR.

Recommendation 14: Shoreline protection features should be constructed as proposed to maintain the shoreline integrity and minimize shoreline erosion.

CEMVN Response 14: Concur.

# 7.0 MITIGATION

Mitigation for unavoidable impacts to the human and natural environment described in this and other IERs will be addressed in separate mitigation IERs. The CEMVN has partnered with Federal and state resource agencies to form an interagency mitigation team that is working to assess and verify these impacts, and to look for potential mitigation sites in the appropriate hydrologic basin. This effort is occurring concurrently with the IER planning process in an effort to complete mitigation work and construct mitigation projects expeditiously. As with the planning process of all other IERs, the public will have the opportunity to give input about the proposed work. These mitigation IERs will, as described in section 1.4 of this IER, be available for a 30-day public review and comment period.

Quantitative analysis utilizing existing methodologies for water resource planning has identified the acreages and habitat type for the direct or indirect impacts of implementing the proposed action. The proposed action was selected because it was designed to minimize impacts to wetlands and as such, no wetlands would be impacted by the construction of a sector gate, dual vertical lift gates, or T-wall tie-ins in. Approximately 7 acres of open water and benthic substrate in the IHNC main channel would be permanently lost to the floodgate structures and associated scour hole fill and riprap. Although the IHNC is a man-made shipping channel, it currently serves as a major conduit between the Gulf of Mexico and Lake Pontchartrain for many species managed by the MSA, and is considered EFH. Significant alterations to this conduit could cause positive and negative impacts to EFH including breeding, transport/migration, and growth to maturity.

A comprehensive mitigation IER or IERs will be prepared documenting and compiling these unavoidable impacts and those for all other proposed actions within the HSDRRS that are being analyzed through other IERs. Mitigation planning is being carried out for groups of IERs, rather than within each IER, so that large mitigation efforts could be taken rather than several smaller efforts, increasing the relative economic and ecological benefits of the mitigation effort.

This forthcoming mitigation IER would implement compensatory mitigation as early as possible. All mitigation activities would be consistent with standards and policies established in appropriate Federal and state laws and USACE policies and regulations.

# 8.0 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Construction of the proposed action would not commence until the proposed action achieves environmental compliance with all applicable laws and regulations, as described below.

Environmental compliance for the proposed action will be achieved upon coordination of this IER with appropriate agencies, organizations, and individuals for their review and comments. This includes USFWS and NMFS confirmation that the proposed action would not be likely to adversely affect any endangered or threatened species, or completion of ESA section 7 consultation (appendix E); LaDNR concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the LaCRP (appendix E); receipt of a Water Quality Certificate from the State of Louisiana (appendix E); public review of the Section 404(b)(1) Public Notice and signature of the Section 404(b)(1) Evaluation; coordination with the Louisiana SHPO (appendix E); receipt and acceptance or resolution of all USFWS Coordination Act recommendations (appendix E); receipt and acceptance or resolution of all LaDEQ comments on the air quality impact analysis documented in the IER; and receipt and acceptance or resolution of all EFH recommendations.

# 9.0 CONCLUSIONS

## 9.1 INTERIM DECISION

The proposed action selected for IER #11 Tier 2 Pontchartrain would be a new flood control feature consisting of a sector gate and dual vertical lift gates for flow augmentation just south of the Seabrook Bridge, and T-wall floodwalls to tie the gates into the existing HSDRRS. All floodgates would be built to elevation of approximately + 16.0 to +18.0 ft NAVD88 and the sector gate would have a 95-foot-wide navigation opening, which is the width of the existing navigational channel and concrete dolphins. The two vertical lift gates would be non-navigable and have a width of no greater than 60 ft. Approximately 1,500 ft of T-walls would be built on existing levees and as tie-ins to the existing LPV 105 and LPV 104 HSDRRS to the east and west of the IHNC, to El +16.0 ft NAVD88. The floodwall on the east side of the channel would include a 20-ft-wide vehicle gate with a sill at existing ground elevation to provide access to Jourdan Road. The CEMVN has assessed the environmental impacts of the proposed action and has determined that the proposed action would have the following impacts:

- **Hydrology –** Significant temporary impacts during construction due to the complete closure of the IHNC for approximately 6 months to 12 months. Alterations in tidal range to the south of the proposed action are anticipated to be greater than to the north due to filling of the existing scour hole. With the implementation of the proposed action, water surface elevations would continue to decrease and velocities are expected to increase during March and September conditions according to ADH modeling.

- **Water Quality –**Temporary impacts to DO and turbidity during construction. Significant temporary impacts to salinity during construction and minimal permanent impacts (0.1 ppt to 0.3 ppt decrease) above those caused by the closure of the MRGO and Borgne Barrier. Possible permanent positive impacts to DO and turbidity due to the filling of the scour hole.

- **Wetlands** – No direct impacts are expected due to that fact that no wetlands occur in the project vicinity.

- **Aquatic Resources and Fisheries** – Significant temporary impacts including decreased larval recruitment and altered DO levels that could potentially result in fish kills may result from the complete closure of the IHNC for approximately 6 months to 12 months. Minimal, temporary impacts from construction noise and increased turbidity. Permanent loss of approximately 7 acres of low-quality open water and benthic habitat, including deep water habitat used by large predatory species. Possible cumulative impacts to larval fish recruitment due to the MRGO closure structure, Borgne Barrier, and the GIWW gate.

- **Essential Fish Habitat** – Temporary impacts to EFH in the vicinity of the project area during construction, and up to 7 acres of open water and waterbottoms in the IHNC would be permanently lost to the new structure and associated ROW. Loss of deep-water habitat but possible beneficial impacts related to improved DO concentrations in the scour hole. Permanent impacts due to changes in hydrology (salinity, DO, and velocity) and possible cumulative impacts to larval fish recruitment due to the MRGO closure structure, Borgne Barrier, and the GIWW gate.

- **Wildlife** – Temporary displacement impacts to wildlife within the vicinity of the project area during construction.

- **Threatened and Endangered Species** – USFWS concurrence on 2 February 2009 with CEMVN finding of not likely to adversely affect the West Indian manatee, provided that standard manatee protection measures would be followed. NMFS concurrence on 31 August 2009 with the finding of not likely to adversely affect the Gulf sturgeon or its designated critical habitat, or Kemp's Ridley, loggerhead, and green sea turtles, provided that standard measures to protect these turtles would be followed.

- **Upland Resources –** No natural uplands in the project area. Temporary impacts during construction to approximately 10 acres of man-made, non-wet upland. Permanent loss of approximately 7 upland acres would have minimal impacts.

- **Cultural Resources** – No direct adverse impacts to cultural resources would be expected, but beneficial indirect and cumulative impacts (from reduced flood risk and storm damage) to the New Orleans Metropolitan Area would be experienced.

- **Recreational Resources** – Temporary construction-related impacts on fish habitat and navigation would reduce recreational opportunities. The MRGO closure at La Loutre, the Borgne Barrier, and the proposed action would cumulatively result in decreased recruitment of recreational fishery species due to the permanent alterations in flow (transport) and salinity.

- **Aesthetic (Visual) Resources** – Localized and minor impacts.

- **Air Quality** – Temporary impacts during construction.

- **Noise** – Temporary impacts to receptors within 1,000 ft of the project area during construction.

- **Transportation** – Waterborne transportation and worker/truck traffic resulting from the project would temporarily impact traffic on local waterways and roads within the vicinity of the project area. Industries currently using the IHNC to connect to Lake Pontchartrain would be impacted due to the complete closure for approximately 6 months to 12 months.

- **Socioeconomic Resources** – Beneficial impacts on population, land use, and employment due to heightened flood risk reduction and construction-generated employment. Temporary significant impacts to businesses operating in the IHNC which use the Seabrook passage to gain access to Lake Pontchartrain during the 12 month closure.

- **Environmental Justice** – Adverse human health and environmental effects are not expected to disproportionately impact minority and/or low income communities. Direct, temporary impacts from project construction activities would occur, but would be limited to within 1-mile of the project area and would equally impact non-minority/non-low populations as well.

## 9.2 PREPARED BY

The point of contact for this IER is Joan M. Exnicios, USACE, New Orleans District. Table 18 lists the preparers of relevant sections of this report. Ms. Exnicios can be reached at the U.S. Army Corps of Engineers, New Orleans District; P.O. Box 60267; New Orleans, Louisiana 70160-0267.

**Table 18.**
**IER #11 Tier 2 Pontchartrain Preparation Team**

| IER Section | Team Member |
|---|---|
| Environmental Manager | Laura Lee Wilkinson, USACE |
| Environmental Team Leader | Gib Owen, USACE |
| Technical Coordinator | Lee Walker, CEMVN – USACE Contractor<br>Randall Kraciun, USACE |
| Project Manager | Roberta Hurley, Earth Tech |
| Project Manager/QA-QC | Kim Fitzgibbons, PBS&J |
| Proposed Action/Alternatives | Evelyn Rogers, P.E., Earth Tech<br>Erika Schreiber, Earth Tech |
| Legal Review | Rita Trotter, CEMVN-Office of Counsel |
| Environmental Setting | Susan Theodosiou, PBS&J |
| Hydrology/Water Quality/Wetlands | Jason Gillespie, HDR |
| Aquatic Resources and Fisheries/EFH | Marisa Weber, PBS&J |
| Upland Resources/Threatened and Endangered Species/Wildlife | Stephen Dillard, Earth Tech<br>Zoe Knesl, Earth Tech |
| Socioeconomics/Navigation/Recreation | Cory Wilkinson, AICP, HDR<br>Andrea Cook, HDR |
| Air Quality/Noise | Meredith Herndon, Earth Tech |
| Transportation | Tony Collins, Earth Tech |
| Environmental Justice | Jerica Richardson, USACE |
| Cultural Resources | Michael Swanda, USACE |
| Aesthetics | Susan Provenzano, AICP, Earth Tech |
| Selection Rationale | Evelyn Rogers, P.E., Earth Tech |
| Cumulative Impacts/Consultation/Mitigation/ Compliance/Conclusions | Zoe Knesl, Earth Tech<br>Erika Schreiber, Earth Tech |
| Hazardous, Toxic, and Radioactive Waste | Erika Schreiber, Earth Tech<br>Dr. Christopher Brown, USACE<br>Dr. Haekyung Kim, USACE<br>Robert Brooks, USACE |
| Administrative Support | Bonnie Freeman, Earth Tech |
| Technical Editor | Jennifer Darville, USACE |
| Independent Technical Review | Tim George, USACE |

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## APPENDIX A

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AAHU | average annual habitat unit |
| AAI | all appropriate inquiry |
| ACB | articulated concrete blocks |
| ADH | Adaptive Hydraulics |
| AEP | Alternative Evaluation Process |
| AICP | American Institute of Certified Planners |
| AST | above-ground storage tank |
| ASTM | American Society for Testing and Materials |
| B.C. | Before Christ |
| BLH | bottomland hardwood |
| BMP | best management practices |
| BO | biological opinion |
| BOD | biological oxygen demand |
| °C | degree Celsius |
| CAA | Clean Air Act |
| CAR | Coordination Act Report |
| CED | Comprehensive Environmental Document |
| CEMVN | Corps of Engineers, Mississippi Valley Division, New Orleans District |
| CEQ | Council on Environmental Quality |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFDC | Caernarvon Freshwater Diversion Canal |
| CFR | Code of Federal Regulations |
| CIAP | Coastal Impact Assistance Program |
| cm | centimeter |
| cm/sec | centimeter per second |
| CNO | City of New Orleans |
| CNOGIS | City of New Orleans Geographic Information System |
| CO | carbon monoxide |
| COD | chemical oxygen demand |
| CPT | cone penetrometer test |
| CRCL | Coalition to Restore Coastal Louisiana |
| CSTR | continuously-stirred tank reaction |
| CWPPRA | Coastal Wetlands Planning, Protection, and Restoration Act |
| cy | cubic yard |
| dB | Decibel |
| dBA | A-weighted decibel |
| DDT | dichlorodiphenyltrichloroethane |
| DNL | day-night average sound level |
| DO | dissolved oxygen |
| EA | Environmental Assessment |
| EBSTP | East Bank Sewer Treatment Plant |
| EFH | essential fish habitat |

| | |
|---|---|
| EIS | Environmental Impact Statement |
| EJ | environmental justice |
| ER | Engineering Regulation |
| ERDC | Engineering Research and Development Center |
| ESA | Environmental Site Assessment |
| ESRI | Environmental Systems Research Institute, Inc. |
| °F | degree Fahrenheit |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| FMC | Fishery Management Council |
| FMP | Fishery Management Plan |
| FR | Federal Register |
| ft | feet |
| FTE | full-time equivalents |
| fps | ft per second |
| GIWW | Gulf Intracoastal Waterway |
| GMFMC | Gulf of Mexico Fishery Management Council |
| GNOCDC | Greater New Orleans Community Data Center |
| GNOEC | Greater New Orleans Expressway Commission |
| GSMFC | Gulf States Marine Fisheries Commission |
| HPD | Harbor Police Department |
| HPS | Hurricane Protection System |
| HSDRRS | Hurricane and Storm Damage Risk Reduction System |
| HTRW | hazardous, toxic, and radioactive waste |
| I – 10 | Interstate 10 |
| IER | Individual Environmental Report |
| IERS | Individual Environmental Report Supplemental |
| IHNC | Inner Harbor Navigation Canal |
| III | Insurance Information Institute |
| IPET | Interagency Performance Evaluation Task Force |
| LaCPR | Louisiana Coastal Protection and Restoration |
| LaDHH | Louisiana Department of Health and Hospitals |
| LaDOTD | Louisiana Department of Transportation and Development |
| LCA | Louisiana Coastal Area |
| LaCRP | Louisiana Coastal Resource Program |
| LCWCRTF | Louisiana Coastal Wetlands Conservation and Restoration Task Force |
| LaDEQ | Louisiana Department of Environmental Quality |
| LaDNR | Louisiana Department of Natural Resources |
| LaDWF | Louisiana Department of Wildlife and Fisheries |
| LF | linear feet |
| LOS | level-of-service |
| LPV | Lake Pontchartrain and Vicinity |
| MDS | Multi- Dimension Sediment |
| mg/L | milligram per liter |
| mm | millimeter |
| mph | miles per hour |

| | |
|---|---|
| MRGO | Mississippi River Gulf Outlet |
| MSA | Magnuson-Stevens Fishery Conservation and Management Act |
| n/a | information not available |
| NAAQS | National Ambient Air Quality Standards |
| NAVD88 | North American Vertical Datum of 1988 |
| NEPA | National Environmental Policy Act |
| NGVD29 | National Geodetic Vertical Datum of 1929 |
| NMFS | National Marine Fisheries Service |
| No. | number |
| NOAA | National Oceanic and Atmospheric Administration |
| NOLANRP | New Orleans Neighborhood Rebuilding Plan |
| NORA | New Orleans Redevelopment Authority |
| NOV | New Orleans to Venice |
| NPS | National Park Service |
| NRCS | Natural Resources Conservation Service |
| NRHD | New Orleans Register Historic District |
| NRHP | National Register of Historic Places |
| $NO_2$ | nitrogen dioxide |
| NOBID | New Orleans Business and Industrial District |
| NTU | nephelometric turbidity unit |
| NWR | National Wildlife Refuge |
| $O_3$ | ozone |
| OCPR | Office of Coastal Protection and Restoration |
| OCS | outer continental shelf |
| OMRR&R | operation, maintenance, repair, replacement, and rehabilitation |
| PA | Programmatic Agreement |
| PAH | polycyclic aromatic hydrocarbon |
| Pb | lead |
| PBS&J | Post, Buckley, Schuh & Jernigan, Inc. |
| PCB | polychlorinated biphenyl |
| PDT | Project Delivery Team |
| P.E. | Professional Engineer |
| PL | Public Law |
| PLC | programmable logic controller |
| PM | particulate matter |
| PPL | Priority Project List |
| ppm | parts per million |
| PPNA | Pontchartrain Park Neighborhood Association |
| PTM | particle tracking modeling |
| ppt | parts per thousand |
| RCG | R. Christopher Goodwin and Associates, Inc. |
| RCRA | Resource Conservation and Recovery Act |
| REC | recognized environmental condition |
| RECAP | Risk Evaluation/Corrective Action Program |
| ROW | right-of-way |
| RPC | Regional Planning Commission |

| | |
|---|---|
| RV | recreational vehicle |
| SAV | submerged aquatic vegetation |
| SHPO | State Historic Preservation Office |
| $SO_2$ | sulfur dioxide |
| sq ft | square feet |
| SWPPP | Stormwater Pollution Prevention Plan |
| TBD | to be determined |
| TCLP | toxicity characteristic leaching procedure |
| TPH | total petroleum hydrocarbon |
| TRB | Transportation Research Board |
| TRM | turf reinforcement mattress |
| UNO | University of New Orleans |
| U.S. | United States |
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USCG | U.S. Coast Guard |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WBV | West Bank and Vicinity |
| WCRA | Wetlands Conservation and Restoration Authority |
| WCSC | Waterborne Commerce Statistics Center |
| WQC | water quality certification |
| WRDA | Water Resources Development Act |

## APPENDIX B

## MODELING REPORTS

- **Seabrook Fish Larval Transport Study, ERDC/CHL TR-08-X**
- **Lake Borgne Surge Barrier Study, ERDC/CHL TR-08-X, (pending external review)**
- **Seabrook and Borgne Alignment Construction Sequence Hydrodynamic Study, ERDC/CHL TR-08-X**
- **Estimation of Dissolved Oxygen Concentrations of Two New Scenarios for Seabrook Conditions, ERDC/CHL TR-08-X**

To access these studies electronically, go to http://www.nolaenvironmental.gov.

To request a hardcopy, contact Laura Lee Wilkinson at 504-862-1212.

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# APPENDIX C

## PUBLIC COMMENT AND RESPONSES SUMMARY

To be added after 30-day public comment period

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## APPENDIX D

## MEMBERS OF INTERAGENCY ENVIRONMENTAL TEAM

| | |
|---|---|
| Kyle Balkum | Louisiana Dept. of Wildlife and Fisheries |
| Brian Marcks | Louisiana Department of Natural Resources |
| Catherine Breaux | U.S. Fish and Wildlife Service |
| David Castellanos | U.S. Fish and Wildlife Service |
| Frank Cole | Louisiana Department of Natural Resources |
| John Ettinger | U.S. Environmental Protection Agency |
| Jeff Harris | Louisiana Department of Natural Resources |
| Richard Hartman | NOAA National Marine Fisheries Service |
| Christina Hunnicutt | U.S. Geological Survey |
| Barbara Keeler | U.S. Environmental Protection Agency |
| Kirk Kilgen | Louisiana Department of Natural Resources |
| Tim Killeen | Louisiana Department of Natural Resources |
| Brian Lezina | Louisiana Department of Wildlife and Fisheries |
| David Muth | U.S. National Park Service |
| Jamie Phillippe | Louisiana Department of Environmental Quality |
| Manuel Ruiz | Louisiana Department of Wildlife and Fisheries |
| Reneé Sanders | Louisiana Department of Natural Resources |
| Angela Trahan | U.S. Fish and Wildlife Service |
| David Walther | U.S. Fish and Wildlife Service |
| Patrick Williams | NOAA National Marine Fisheries Service |

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# APPENDIX E

# INTERAGENCY CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
January 30, 2007

RECEIVED BY
USACE CEMVN
2 FEBRUARY 2009

Colonel Michael McCormick
Hurricane Protection Office (HPO)
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel McCormick:

Please reference the December 31, 2008, letter from Mr. Gib Owen, Acting Chief of the Environmental Planning and Compliance Branch, requesting our concurrence with determinations regarding impacts to threatened or endangered species and their critical habitat made by U.S. Army Corps of Engineers' (Corps) for work proposed in Individual Environmental Reports (IER) 5-11 in Orleans, Jefferson, and St. Bernard Parishes. Those projects would involve improvements to levees, floodwalls, floodgates, and construction of new barriers, closure structures, navigable gates and/or permanent pump stations in the New Orleans East Bank, New Orleans East and Chalmette Loop sub basins. These improvements are necessary to provide 100-year level flood protection for the New Orleans Metropolitan area. The U.S. Fish and Wildlife Service (Service) has reviewed the information provided, and offers the following comments in accordance with the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d), Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The projects included in IERs 5-11 span a large geographic area and have unique components, but the number of potentially impacted threatened or endangered species is small; therefore, the IERs will be grouped according to potentially affected species.

Federally listed as an endangered species, West Indian manatees (*Trichechus manatus*) occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences appear to be increasing, and they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of Louisiana. They have also been occasionally observed elsewhere along the Louisiana Gulf coast. The manatee has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals.

Some or all of the proposed project features, including alternatives, of IERs 5, 6, 7, 8, and 11 (especially the dredging of access channels for IERs 6 and 7), could potentially impact the manatee. The Corps has incorporated the following protective measures into its construction contracts; therefore, the Service concurs with your determination that construction of the proposed project features is not likely to adversely affect the manatee.

All contract personnel associated with the project should be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. All construction personnel are responsible for observing water-related activities for the presence of manatee(s). Temporary signs should be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work area), and at least one sign should be placed where it is visible to the vessel operator. Siltation barriers, if used, should be made of material in which manatees could not become entangled, and should be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions should be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels should operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, should be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations would be resumed. Any manatee sighting should be immediately reported to the Service's Lafayette, Louisiana Field Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821).

The Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), federally listed as a threatened species, is an anadromous fish that occurs in many rivers, streams, and estuarine waters along the northern Gulf coast between the Mississippi River and the Suwanee River, Florida. In Louisiana, Gulf sturgeon have been reported at Rigolets Pass, rivers and lakes of the Lake Pontchartrain basin, and adjacent estuarine areas. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May). Adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. Habitat alterations such as those caused by water control structures that limit and prevent spawning, poor water quality, and over-fishing have negatively affected this species.

On March 19, 2003, the Service and the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana were included in that designation. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support those habitat components.

In that critical habitat designation, responsibility for consultation with specific Federal agencies was also identified for the Service and for the NMFS. For estuarine and marine waters in

disturbance. The Service concurs that construction of the proposed project features is not likely to adversely affect the brown pelican.

Louisiana, the NMFS is responsible for consultations regarding impacts to the sturgeon and its critical habitat with all Federal agencies, except the Department of Transportation, the Environmental Protection Agency, the U.S. Coast Guard, and the Federal Emergency Management Agency, which consult with the Service. Therefore, please contact Dr. Stephania Bolden (727/824-5312) in St. Petersburg, Florida, for information concerning that species and its critical habitat. Should the proposed project directly or indirectly affect the Gulf sturgeon or its critical habitat in Louisiana, further consultation with that office will be necessary.

The project-area forested wetlands may provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), which has officially been removed from the List of Endangered and Threatened Species as of August 8, 2007, however the bald eagle continues to be protected under the MBTA and the BGEPA. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern parishes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants.

The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at:
http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. The construction of the proposed project features for IER 10, Reach LPV 148, may potentially impact the bald eagle. If the Corps determines that construction activities will be located at or closer than 660 feet from a nest tree, the Service recommends that the Corps conduct an on-line evaluation at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. A copy of that determination should be provided to this office. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting such consultations. Should you need further assistance interpreting the guidelines or performing an on-line project evaluation, please contact our office.

Federally listed as an endangered species, brown pelicans (*Pelecanus occidentalis*) are not currently known to nest in the project vicinity. Brown pelicans feed along the Louisiana coast in shallow estuarine waters, using sand spits and offshore sand bars as rest and roost areas. Major threats to this species include chemical pollutants, colony site erosion, disease, and human disturbance. The Service concurs that construction of the proposed project features is not likely to adversely affect the brown pelican.

IERs 6, 7, 8, 9, and 10 are located where colonial nesting waterbirds may be present. LDWF currently maintains a database of these colonies locations. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work sites for the presence of undocumented nesting colonies during the nesting season (e.g. February through September depending on the species). If colonies exist, work should not be conducted within 1,000 feet of the colony during the nesting season

Portions of IER 6 and 7 are located within or may require access through the Service's Bayou Sauvage National Wildlife Refuge. The National Wildlife Refuge System Improvement Act of 1997 authorized that no new or expanded use of a refuge may be allowed unless it is first determined to be compatible. A compatibility determination is a written determination signed and dated by the Refuge Manager and Regional Refuge Chief, signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. A compatible use is defined as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. A compatibility determination is only required when the Service has jurisdiction over the use. For example, proposed uses that deal exclusively with air space, navigable waters or overly refuges where another Federal agency has primary jurisdiction over the area, would not be subject to compatibility.

Federal agencies proposing a project that includes features on a national wildlife refuge are encouraged to contact the Refuge Manager early in the planning process. The Refuge Manager will work with the project proponent to determine if the proposed project constitutes a "refuge use" subject to a compatibility determination. If the proposed project requires a compatibility determination, a concise description of the project (refuge use) including who, what, where, when, how, and why will be needed to prepare the compatibility determination. In order to determine the anticipated impacts of use, the project proponent may be required to provide sufficient data and information sources to document any short-term, long-term, direct, indirect or cumulative impacts on refuge resources. Compatibility determinations will include a public review and comment before issuing a final determination.

All construction or maintenance activities (e.g., surveys, land clearing, etc.) on a National Wildlife Refuge (NWR) will require the Corps to obtain a Special Use Permit from the Refuge Manager; furthermore, all activities on that NWR must be coordinated with the Refuge Manager. Therefore, we recommend that the Corps request issuance of a Special Use Permit well in advance of conducting any work on the refuge. Please contact Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan Refuge Manager for the Bayou Sauvage National Wildlife Refuge at (985) 822-2000, for further information on compatibility of flood control features, and for assistance in obtaining a Special Use Permit. Close coordination by both the Corps and its contractor must be maintained with the Refuge Manager to ensure that construction and maintenance activities are carried out in accordance with provisions of any Special Use Permit issued by the NWR.

Based on our review, the Service concurs with your determinations that the construction of the proposed project features in IERs 5-11 is not likely to adversely affect the brown pelican, and because of manatee protective measures included in the Corps' construction contracts, the Service also concurs that the construction of the proposed project features in IERs 5-11 is not likely to adversely affect the manatee. The Service recommends that the Corps contact NMFS regarding impacts to the Gulf sturgeon and its critical habitat and implement the above mentioned survey and protection measure to protect colonial nesting birds. The Service is also willing to assist the Corps evaluate the potential impacts to the bald eagle under the NBEM Guidelines.

We appreciate the opportunity to review the proposed 100 Year Hurricane Protection Projects for IERs 5-11. If you need further assistance or have questions regarding this letter, please contact David Walther (337/291-3122) of this office.

Sincerely,

for James F. Boggs
Field Supervisor
Louisiana Field Office

cc: NOAA, St. Petersburg, FL
Laura Lee Wilkinson, CEMVN, New Orleans, LA
LDWF, Natural Heritage, Baton Rouge, LA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5312, FAX 824-5309
http://sero.nmfs.noaa.gov

AUG 3 1 2009 F/SER31:KS

Mr. Richard E. Boe
New Orleans District Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160-0267

Re: IERs 3 and 11 Tier 2

Dear Mr. Boe:

This responds to your letter dated June 23, 2009, requesting section 7 consultation pursuant to the Endangered Species Act (ESA) for the Army Corps of Engineers' (COE) Individual Environmental Reports (IER) 3 and 11 Tier 2. The reports evaluate the COE's proposal to upgrade the existing hurricane protection system to protect communities and infrastructure in Orleans Parish, Louisiana, from 100-year level storms. The proposed projects modify previously authorized activities under IERs 3 and 11 Tier 2 by adding additional foreshore protection features along the southern shoreline of Lake Pontchartrain, detour lanes for the Lake Pontchartrain Causeway, and a storm surge protection structure at the Inner Harbor Navigation Canal (IHNC) near New Orleans, Louisiana. You requested concurrence from the National Marine Fisheries Service (NMFS) with your determination the projects are not likely to adversely affect the threatened Gulf sturgeon and its designated critical habitat. NMFS' determinations regarding the effects of the proposed action are based on the description of the action in this and all related consultation documents. You are reminded that any changes to the proposed action may negate the findings of the present and completed consultations and may require reinitiation of consultation with NMFS.

*Alternative Arrangements for NEPA and Incremental ESA Analysis*

The hurricane protection projects proposed in IERs 3 and 11 Tier 2 are components of the COE's comprehensive plan to upgrade existing structures in the Greater New Orleans Hurricane and Storm Damage Risk Reduction System, which was authorized and funded under Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery (2006). The 17 projects included in the proposed comprehensive plan will upgrade the existing hurricane protection system, damaged and weakened by Hurricanes Katrina and Rita in 2005, to reduce the threats to communities and infrastructure from 100-year level storms. On March 13, 2007, the COE implemented Alternative Arrangements under the provisions of the Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (NEPA; 40 CFR 1506.11) to expedite complete environmental analysis for the proposed comprehensive plan. The Alternative Arrangements allow decisions on individual components of the overall proposed action so that the process can be completed more quickly than under the traditional NEPA process. The COE deemed the Alternative Arrangements necessary to reduce the risk of flooding and to restore public confidence in the hurricane protection system so that economic recovery of the area could proceed. When sufficient information is available from each of the IERs analyzing the proposed individual projects making up the comprehensive plan, the COE will produce a draft Comprehensive Environmental Document (CED). The CED will incorporate the IERs by reference and address the work completed, as well as the remaining work to be completed, on a system-wide scale and include a final mitigation plan. The COE has committed to NMFS that if individual and/or cumulative effects to listed species or designated critical habitat not previously addressed in IERs that have undergone consultation are subsequently identified in the CED, the COE will reinitiate consultation with NMFS.

The Endangered Species Act has been interpreted by courts, including the Supreme Court of the United States, as requiring comprehensive consultation on the entire scope of a proposed project or plan. Incremental consultation on separate stages or phases of a project is allowable only where the project is implemented under statutes that authorize staged decision-making, including staged environmental reviews and the potential for modification or cancellation of subsequent stages.

The regulations implementing the ESA include provisions at 50 CFR 402.14(k) for consulting on projects in incremental steps that are based on the caselaw discussed above. Section 402.14(k) provides that:

> Incremental steps. When the action is authorized by a statute that allows the agency to take incremental steps toward the completion of the action, the Service shall, if requested by the Federal agency, issue a biological opinion on the incremental step being considered, including its views on the entire action. Upon the issuance of such a biological opinion, the Federal agency may proceed with or authorize the incremental steps of the action if:
> (1) The biological opinion does not conclude that the incremental step would violate section 7(a)(2);
> (2) The Federal agency continues consultation with respect to the entire action and obtains biological opinions, as required, for each incremental step;
> (3) The Federal agency fulfills its continuing obligation to obtain sufficient data upon which to base the final biological opinion on the entire action;
> (4) The incremental step does not violate section 7(d) of the Act concerning irreversible or irretrievable commitment of resources; and
> (5) There is a reasonable likelihood that the entire action will not violate section 7(a)(2) of the Act.

In accordance with these provisions, the consultation on each incremental step must be in the context of the entire action (i.e., the effects of all previous steps should be considered in the evaluation of the effects of the current step). NMFS has previously completed consultations on

IERs 2, 3, 5, 6, 7, and 11. Therefore, this consultation will consider the effects of those projects in the evaluation of the effects of the currently proposed actions, modified IERs 3 and 11 Tier 2, on listed species and critical habitat under NMFS purview.

*Previously Authorized IER Projects*

Section 7 consultation was completed on IER 2 on June 6, 2008. The project consists of replacing existing floodwalls with new T-walls, constructing a breakwater, and dredging a channel for equipment access in the western portion of Lake Pontchartrain in Jefferson and St. Charles Parishes, Louisiana. NMFS determined project activities are not likely to adversely affect Gulf sturgeon or listed sea turtles (Kemp's ridley, green, or loggerhead) potentially found in the project area. The project is not located in designated Gulf sturgeon critical habitat and has not yet been constructed.

Consultation for IER 3 was completed on May 28, 2008; consultation on modifications to the project was completed on November 6, 2008. The project, as modified, consists of the construction of a cement breakwater, the addition of rock riprap to existing foreshore protection along the shoreline, and dredging for equipment access in Lake Pontchartrain in Jefferson Parish, Louisiana. NMFS determined project activities are not likely to adversely affect Gulf sturgeon or listed sea turtles (Kemp's ridley, green, or loggerhead) potentially found in the project area. In addition, NMFS determined that IER 3 was not likely to adversely affect designated Gulf sturgeon critical habitat in Unit 8. Water quality impacts related to dredging and stockpiling of dredged material are expected to be insignificant because they will be temporary and minimized by the use of silt curtains. Potential effects to sediment quality resulting from dredging and stockpiling of dredged material will also be insignificant. While dredging may temporarily uncover a layer of finer-grained sediment, the original material will be placed back in the channel and sediment quality will be returned to pre-project conditions. Prey abundance will be temporarily affected by the dredging of 9 acres of waterbottom and the placement of dredged material on 20 acres of waterbottom. However, the project area encompasses only a small portion of the 403,200 acres of available habitat in Lake Pontchartrain supporting Gulf sturgeon prey items. Stockpiled material will be placed back into the dredged channels upon project completion and returned to pre-project contours. Benthic invertebrates utilized by Gulf sturgeon are expected to recolonize the dredged area rapidly, as they have been found to recolonize within one year when sediment composition and depth remain consistent. The permanent loss of 9 acres of habitat (due to the construction of the breakwater, riprap, and foreshore protection) on prey abundance is also expected to be insignificant. Gulf sturgeon prey are expected to be found in sandy substrate, while the substrate found at the site of the breakwater is mainly hard bottom. Further, Gulf sturgeon are expected to be found in deeper waters (2 to 4 meters) than those at the site of the proposed foreshore protection (less than 1 meter). The project has not yet been constructed.

Consultation on IER 11 was completed on August 12, 2008. The project consists of construction of storm surge protection structures (flood control gates and concrete floodwalls) and dredging for equipment access between the IHNC and Lake Borgne in Orleans and St. Bernard Parishes, Louisiana. NMFS determined project activities are not likely to adversely affect Gulf sturgeon or listed sea turtles (Kemp's ridley, green, or loggerhead) potentially found in the project area. Although not located in designated Gulf sturgeon critical habitat, the project is hydrologically connected to designated critical habitat in Unit 8. Based on modeling reports and analyses provided by the COE, the project will not significantly affect hydroperiod, salinity, ability for benthic communities to be established and maintained, water velocity, dissolved oxygen, siltation, or accessibility; therefore, NMFS determined the project was not likely to adversely affect designated Gulf sturgeon critical habitat. This project is currently under construction.

Consultation for IERs 6 and 7 was completed on March 13, 2009. The projects include the placement of rock on the existing foreshore protection to raise its elevation on several sections of the levee system on Lake Pontchartrain near New Orleans, Louisiana. The elevation of 11 miles of existing foreshore protection will be raised to 14 feet NAVD88 by placing additional rock on the structure. To access the foreshore protection for rock placement, a bucket dredge will be used to excavate. Approximately 44 acres of waterbottom will be dredged and 134 acres of waterbottom will be temporarily covered by the stockpiled dredged material, resulting in temporary impacts to 178 acres of benthic habitat through burying and physical disruption of potential prey. Permanent impacts will result from the placement of rock on the existing foreshore protection, which will extend into the water and permanently cover an additional 14 acres of waterbottom. Water depths in the area where the rock will be placed are less than 1 meter deep. NMFS concluded that sea turtles and Gulf sturgeon are not likely to be adversely affected by the proposed projects. NMFS also determined that the temporary loss of 178 acres of benthic habitat due to dredging and stockpiling of dredged material, and the permanent loss of 14 acres of habitat due to placement of rock on the existing foreshore protection is not likely to adversely affect Gulf sturgeon critical habitat. Water depths at the project sites are less than 1 meter and these areas experience high wave energy. Gulf sturgeon are suction feeders; due to their feeding morphology, they are usually found at deeper depths (2 to 4 meters), where lower wave energy at the substrate, compared to the shallower swash zone, interferes less with feeding. IERs 6 and 7 have not yet been constructed.

Formal consultation for IER 5 was completed on April 17, 2009. The proposed action includes the installation of a 104- by 600-foot breakwater in front of the 17th Street canal pump station and a 116- by 700-foot breakwater at the Orleans Avenue canal pump station. Breakwaters will be constructed out of rock and concrete, and materials will be placed from land by crane where pumping station outfall canals meet Lake Pontchartrain. No dredging is required. NMFS concluded that listed sea turtles and Gulf sturgeon are not likely to be adversely affected by the proposed project. Construction will result in the permanent loss of 3.3 acres of designated critical habitat for Gulf sturgeon due to breakwater construction. NMFS analyzed the project's effects on the primary constituent elements of Gulf sturgeon critical habitat. Prey abundance will be adversely affected by the project, but not to the extent that it would reduce the critical habitat's ability to support Gulf sturgeon conservation.

*Currently Proposed Projects*

The project proposed under IER 3 is located at 30.0211°N, 90.1450°W (WGS84) in Jefferson Parish, Louisiana. The original project proposal involved the placement of rock on the existing foreshore protection to raise its elevation on five sections of the levee system on Lake Pontchartrain near New Orleans, Louisiana. Recent nearshore bathymetric data in Lake Pontchartrain show that the water depths are greater than what was initially used to develop the 100-year lakefront levee elevations. Because levee design is constrained by project location and soil substrate conditions, the project has been modified to add wave attenuation structures on the lakeside of the levees to meet the wave overtopping rate criteria. Wave attenuation structures consisting of earthen berms with graded rock will be added to Reaches 1-3 of the project area. Reaches 4 and 5 will not require wave attenuation structures, but will require additional rock foreshore protection beyond what was originally proposed. The foreshore protection structures originally proposed for IER 3 would permanently cover 26 acres of waterbottoms in Lake Pontchartrain, 4 acres of which were located in Gulf sturgeon critical habitat. The wave attenuation structures and additional foreshore protection proposed in this modification to IER 3 will result in 57 acres of additional permanent impacts to Lake Pontchartrain, 4 acres of which (associated with the additional foreshore protection proposed for Reach 5) will occur in Gulf sturgeon critical habitat. Water depth in the area where the foreshore protection will be constructed is less than 1 meter.

Placement of rock on foreshore protection proposed in IER 3 will require the dredging of barge access channels in Lake Pontchartrain. Bottom substrates in the project area consist of a 7-foot layer of silty sand, underlain by a 4-foot layer of soft clay. Dredging would occur entirely within the 7-foot silty sand layer. A bucket dredge will be used to create access channels between 250 and 350 feet long. Dredged material will be stockpiled adjacent to the access channels in an area 100 feet wide and will be returned to the channel upon project completion. In addition, construction activities on the Lake Pontchartrain Causeway will require the construction of detour lanes. A bucket dredge will be used to create 500- x 100-foot access channels on both sides of the Lake Pontchartrain Causeway for equipment barge access. Dredged material will be stockpiled adjacent to the access channels in an area 1000- by 125-feet wide and will be returned to the channel upon project completion. Silt curtains will be used to contain stockpiled dredged material until it is placed back in the access channels. Dredging access channels and stockpiling of dredged material originally proposed in IER 3 would temporarily affect 116 acres of waterbottoms in Lake Pontchartrain, 29 acres of which are located in Gulf sturgeon critical habitat. The additional access channel dredging and stockpiling of dredged material proposed in this modification to IER 3 will temporarily affect 203.5 acres of waterbottoms, 5.2 acres of which are located in Gulf sturgeon critical habitat.

The project proposed under IER 11 Tier 2 is centered at 30.0064°N, 89.9146°W (WGS84) in Orleans and St. Bernard Parishes. The proposed action consists of the installation of a steel sector gate and two vertical lift gates in the IHNC. Floodwalls would connect the gates to earthen levees on the banks of the IHNC. A 350- by 1,050-foot, 86-foot-deep scour hole in the footprint of the proposed sector and lift gates will be filled with sand. Levees, floodwalls, and the channel may also be armored to prevent erosion and additional scouring. A cofferdam will be put in place during construction and will block water flow from the IHNC into Lake Pontchartrain for a period of 6 to 12 months. Gulf sturgeon have never been observed in the IHNC. The primary pathway between Lake Pontchartrain, Mississippi Sound, and the riverine portions of Gulf sturgeon critical habitat is through Lake Borgne and The Rigolets. While Gulf sturgeon could potentially enter the IHNC, this location is a less suitable access point for Gulf sturgeon to enter and exit Lake Pontchartrain, as it is an artificial canal in a heavily industrialized area and represents a much lengthier, circuitous route between critical habitat areas. As a precautionary measure, before the cofferdam is dewatered for construction activities to commence, the area will be surveyed for the presence of Gulf sturgeon. If any sturgeon are observed, the COE will reinitiate consultation with NMFS on the appropriate means for relocating Gulf sturgeon to a safe location away from the project area. Once construction is completed and the cofferdam removed, unrestricted flow between the IHNC and Lake Pontchartrain will be restored. Although not located in designated Gulf sturgeon critical habitat, the project is hydrologically connected to designated critical habitat in Unit 8.

*Effects to Species and Designated Critical Habitat from Previous and Currently Proposed IER Projects*

As discussed in a previous section of the document, in accordance with the provisions of the ESA at 50 CFR 402.14(k), section 7 consultation on each incremental step of a phased/staged action must be in the context of the entire action (i.e., the effects of all previous steps should be considered in the evaluation of the effects of the current step). NMFS has previously completed consultations on IERs 2, 3, 5, 6, 7, and 11. Therefore, this consultation will consider the effects of those projects in the evaluation of the effects of the currently proposed actions, IERs 3 and 11 Tier 2, on listed species and critical habitat under NMFS purview.

In addition to Gulf sturgeon, three listed species of sea turtles may occur at the project sites: the endangered Kemp's ridley, the threatened/endangered[1] green, and the threatened loggerhead. The currently proposed IER 3, as well as IERs 5, 6, and 7, are located within designated Gulf sturgeon critical habitat Unit 8. Although not located in critical habitat, IER 11 Tier 2 is hydrologically connected to Unit 8. The primary constituent elements (PCEs) essential for the conservation of Gulf sturgeon present in Unit 8 include: abundant prey items; water quality and sediment quality necessary for normal behavior, growth, and viability of all life stages; and, safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats. Of these PCEs, NMFS believes water quality, sediment quality, and prey abundance may be affected.

NMFS has analyzed the routes of potential effects from the proposed projects in IERs 2, 3, 6, 7, and 11 and concluded that listed sea turtles and Gulf sturgeon are not likely to be adversely affected from the suite of activities proposed. The risk of injury to listed species from dredging activities associated with IERs 3, 6, and 7 will be discountable based on the type of dredges being used. There are no reported takes of sea turtles or Gulf sturgeon by a bucket dredge. In addition, dredging will occur within a May to September dredging window for IERs 6 and 7. Gulf sturgeon are not likely to be present during dredging activities for IERs 6 and 7 because they primarily utilize Lake Pontchartrain for winter foraging and dredging will only occur in the summer. Further, the likelihood of sea turtles and Gulf sturgeon being struck by the transit and anchoring of equipment and vessels at the project site is discountable due to these species' mobility. The likelihood of effects to Gulf sturgeon and sea turtles from dredging and the transit and anchoring of equipment and vessels were also determined to be discountable in the consultations on IERs 2 and 11 Tier 2 due to these species' mobility, the type of dredges being used, and/or the lack of species' presence in dredging sites located in marsh or in heavily

[1]Green turtles are listed as threatened, except for breeding populations in Florida and the Pacific Coast of Mexico, which are listed as endangered.

controlled artificial waterways of low habitat value.

NMFS considers the temporary loss of 203.5 acres of benthic habitat due to dredging and stockpiling of dredged material, and the permanent loss of 57 acres of habitat due to the construction of foreshore protection and wave attenuation structures, proposed in IER 3 as having insignificant effects on sea turtles and Gulf sturgeon. The project area encompasses only a small portion of the 403,200-acre lake and there is similar habitat in the vicinity such that impacts to foraging success, reproduction, resting, or other activities that might occur in the area are expected to be minor and insignificant. The area likely provides poor quality habitat for listed species under NMFS' purview. The bottom substrate does not support submerged aquatic vegetation and is likely a poor source of other forage resources for sea turtle species. Due to the shallow water depth and high-energy wave environment where the rock will be placed, the project area provides poor foraging habitat for Gulf sturgeon, as well. Water depths at the site are less than 1 meter. Gulf sturgeon are usually found at deeper depths (2 to 4 meters), where lower wave energy at the substrate, compared to the shallower swash zone, interferes less with feeding.

We evaluated the potential impacts on listed species from the additive loss of a total of 653.8 acres of habitat (546.8 temporarily, 107 permanently) from implementing IERs 2, 3, 6, 7 and 11. If all impacts occurred in areas utilized by species under NMFS' purview, then only 0.16 percent of the available habitat in Lake Pontchartrain would be temporarily or permanently lost. There is sufficient available habitat in the vicinity such that impacts to foraging success, reproduction, resting, or other behaviors are expected to be minor and insignificant. However, all of the permanent impacts and a portion of the temporary impacts will occur in areas that are not utilized by listed species under NMFS' purview because: (1) they consist of marsh, peat substrate, or hardbottom that do not support prey species or other foraging resources for sturgeon and sea turtles; (2) the sites have high wave energy that interferes with feeding; and, (3) they are much shallower (less than 1 meter) than depths preferred by sturgeon and sea turtles. Project activities in IER 11 will not impact habitat in Lake Pontchartrain, but may cause sea turtles and Gulf sturgeon to temporarily avoid the project site due to construction noise. Also, the operation of flood control structures could potentially hinder access by sea turtles and sturgeon to Lake Pontchartrain, but the structures will remain open at all times with the exception of major storms or hurricanes and many other access points to the lake will remain available to these species.

NMFS and the United States Fish and Wildlife Service jointly designated Gulf sturgeon critical habitat on April 18, 2003 (50 CFR 226.214). NMFS believes the suite of project activities in IERs 3, 6, 7, and 11 Tier 2[2] may affect but are not likely to adversely affect Gulf sturgeon critical habitat in Unit 8. While construction of the breakwaters in IER 5 will diminish prey abundance locally, it will not reduce the critical habitat's ability to support Gulf sturgeon conservation. Water quality PCE impacts related to dredging and stockpiling of dredged material in IERs 3, 6, and 7 are expected to be insignificant because they will be temporary and minimized by the use of silt curtains. Potential effects to the sediment quality PCE resulting from dredging and stockpiling of dredged material will also be insignificant. Sediment substrates remaining in access channels after dredging associated with IERs 3, 6, and 7 are expected to be the same as the

[2]Project activities in IER 2 are not located in designated critical habitat.

pre-project sediments. The original material will be placed back in the channels after project construction and sediment quality will be returned to pre-project conditions. Further, the placement of inert, non-toxic rock in these projects will not affect water quality or sediment quality. Prey abundance will be temporarily affected by the dredging of 55.7 acres of waterbottom and the placement of dredged material on 156.5 acres of waterbottom associated with IERs 3, 6, and 7. The total temporary loss of Gulf sturgeon critical habitat from activities in IERs 3, 6, and 7 of 212.2 acres will be insignificant. This represents only a small portion (0.05 percent) of the available habitat in Lake Pontchartrain supporting Gulf sturgeon prey items. Further, stockpiled material will be placed back into the dredged channels upon project completion and returned to pre-project contours. Benthic invertebrates utilized by Gulf sturgeon are expected to recolonize the dredged area rapidly, as they have been found to recolonize within one year when sediment composition and depth remain consistent. The permanent loss of 30.3 acres of designated critical habitat will result from the construction of foreshore protection and breakwaters associated with IERs 3, 5, 6, and 7. The adverse affects to prey abundance from the construction of breakwaters on 3.3 acres of waterbottom associated with IER 5 was evaluated in a formal consultation. NMFS determined the project's effects will not reduce the critical habitat's ability to support Gulf sturgeon conservation. The total permanent loss of prey associated with construction activities in IERs 3, 6, and 7 affecting 27 acres will be insignificant and will not have adverse cumulative effects when combined with the activities in IER 5. Water depths at the project sites are less than 1 meter and these areas experience high wave energy. Gulf sturgeon are suction feeders; due to their feeding morphology, they are usually found at deeper depths (2 to 4 meters), where lower wave energy at the substrate, compared to the shallower swash zone, interferes less with feeding. Although not located in designated Gulf sturgeon critical habitat, project activities in IER 11 are hydrologically connected to designated critical habitat in Unit 8. Based on modeling reports and analyses provided by the COE, the project will not significantly affect hydroperiod, salinity, the ability for benthic communities to be established and maintained, water velocity, dissolved oxygen, siltation, or accessibility; therefore, NMFS determined the project was not likely to adversely affect designated Gulf sturgeon critical habitat.

*Analysis of Compliance with 50 CFR 402.14(k)*

As discussed above, NMFS has determined that the incremental step of implementing IERs 3 and 11 Tier 2 will not violate section 7(a)(2) of the ESA, as required in 50 CFR 402.12(k)(1). The COE has complied with 50 CFR 402.14(k) paragraphs (2) and (3) by consulting with NMFS on all newly proposed IERs that may affect species or critical habitat under NMFS' purview, and through ongoing information collection, reinitiated consultation when projects were modified and new or unanticipated effects of previous actions became apparent. Based on information provided by the COE, the current consultation is the last consultation for projects proposed as part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System and contains a complete assessment of the impacts of all projects on listed species and critical habitat under NMFS' purview. Because no further consultations will occur, there will be no irreversible or irretrievable commitment of resources that would foreclose the implementation of reasonable and prudent alternatives, as prohibited by paragraph (4) of 50 CFR 402.14(k) of the ESA. After reviewing the effects of IERs 3 and 11 Tier 2 in conjunction with the effects associated with the other IER projects evaluated to date as part of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System, we conclude that there are no additive effects of the overall projects that rise above the level of effects considered for each of the individual component projects. As required by 50 CFR 402.14(k) paragraph (5), we conclude that the entire action will not violate section 7(a)(2) of the ESA. Therefore, based on available information to date, we conclude that consultations on the IER projects under the Alternative Arrangements comply with all the provisions contained in 50 CFR 402.14(k) for consultations on incremental actions.

This concludes your consultation responsibilities under the ESA for species under NMFS' purview unless additional information on IER projects under the comprehensive plan to upgrade the Greater New Orleans Hurricane and Storm Damage Risk Reduction System becomes available. Consultation must also be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action. We have enclosed additional information on other statutory requirements that may apply to this action, and on NMFS' Public Consultation Tracking System (PCTS) to allow you to track the status of ESA consultations.

Thank you for your continued cooperation in the conservation of threatened and endangered species under NMFS' purview. If you have any questions on this consultation or PCTS, please contact Kelly Shotts at (727) 824-5312, or by e-mail at kelly.shotts@noaa.gov.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

cc: F/SER43, Hartman/Williams

File: 1514-22 F.1. LA
Ref: I/SER/2009/03605

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**PCTS Access and Additional Considerations for ESA Section 7 Consultations (Revised 7-15-2009)**

Public Consultation Tracking System (PCTS) Guidance: PCTS is an online query system at **https://pcts.nmfs.noaa.gov/** that allows federal agencies and U.S. Army Corps of Engineers' (COE) permit applicants and their consultants to ascertain the status of NMFS' Endangered Species Act (ESA) and Essential Fish Habitat (EFH) consultations, conducted pursuant to ESA section 7, and Magnuson-Stevens Fishery Conservation and Management Act's (MSA) sections 305(b)2 and 305(b)(4), respectively. Federal agencies are required to enter an agency-specific username and password to query the Federal Agency Site. The COE "Permit Site" (no password needed) allows COE permit applicants and consultants to check on the current status of Clean Water Act section 404 permit actions for which NMFS has conducted, or is in the process of conducting, an ESA or EFH consultation with the COE.

For COE-permitted projects, click on "Enter Corps Permit Site." From the "Choose Agency Subdivision (Required)" list, pick the appropriate COE district. At "Enter Agency Permit Number" type in the COE district identifier, hyphen, year, hyphen, number. The COE is in the processing of converting its permit application database to PCTS-compatible "ORM." An example permit number is: SAJ-2005-000001234-IPS-1. For the Jacksonville District, which has already converted to ORM, permit application numbers should be entered as SAJ (hyphen), followed by 4-digit year (hyphen), followed by permit application numeric identifier with no preceding zeros. For example: SAJ-2005-123; SAJ-2005-1234; SAJ-2005-12345.

For inquiries regarding applications processed by COE districts that have not yet made the conversion to ORM (e.g., Mobile District), enter the 9-digit numeric identifier, or convert the existing COE-assigned application number to 9 numeric digits by deleting all letters, hyphens, and commas; converting the year to 4-digit format (e.g., -04 to 2004); and adding additional zeros in front of the numeric identifier to make a total of 9 numeric digits. For example: AL05-982-F converts to 200500982; MS05-04401-A converts to 200504401. PCTS questions should be directed to Eric Hawk at Eric.Hawk@noaa.gov. Requests for username and password should be directed to PCTS.Usersupport@noaa.gov.

EFH Recommendations: In addition to its protected species/critical habitat consultation requirements with NMFS' Protected Resources Division pursuant to section 7 of the ESA, prior to proceeding with the proposed action the action agency must also consult with NMFS' Habitat Conservation Division (HCD) pursuant to the MSA requirements for EFH consultation (16 U.S.C. 1855 (b)(2) and 50 CFR 600.905-.930, subpart K). The action agency should also ensure that the applicant understands the ESA and EFH processes; that ESA and EFH consultations are separate, distinct, and guided by different statutes, goals, and time lines for responding to the action agency; and that the action agency will (and the applicant may) receive separate consultation correspondence on NMFS letterhead from HCD regarding their concerns and/or finalizing EFH consultation.

Marine Mammal Protection Act (MMPA) Recommendations: The ESA section 7 process does not authorize incidental takes of listed or non-listed marine mammals. If such takes may occur an incidental take authorization under MMPA section 101 (a)(5) is necessary. Please contact NMFS' Permits, Conservation, and Education Division at (301) 713-2322 for more information regarding MMPA permitting procedures.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

October 23, 2009

Colonel Robert Sinkler
Commander
Hurricane Protection Office
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Sinkler:

Please reference the Individual Environmental Report (IER) 11, Tier 2 Pontchartrain, for the Improved Protection on the Inner Harbor Navigation Canal (IHNC), Orleans and St. Bernard Parishes, Louisiana. That IER is being prepared under the approval of the Council on Environmental Quality (CEQ) that will partially fulfill the U.S. Army Corps of Engineers (Corps) compliance with the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4) and Public Law 110-28, U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007 (5th Supplemental). Those laws authorized the Corps to upgrade two existing hurricane protection projects [i.e., Westbank and Vicinity of New Orleans (WBV) and Lake Pontchartrain and Vicinity (LPV)] in the Greater New Orleans area in southeast Louisiana. This draft report contains a description of resources in the project area and provides planning objectives and recommendations to minimize project impacts on those resources.

The proposed project was authorized by Supplemental 4 which instructed the Corps to proceed with engineering, design, and modification (and construction where necessary) of the LPV and the WBV Hurricane Protection Projects so those projects would provide 100-year hurricane protection. Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination

Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has precluded the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing post-authorization 2(b) reports for each IER.

This draft report incorporates and supplements our FWCA Reports that addressed impacts and mitigation features for the WBV of New Orleans (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the LPV (dated July 25, 1984 and January 17, 1992) Hurricane Protection projects, the November 26, 2007, Draft Programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4, and the October 9, 2008, Final FWCA Report and September 18, 2009, Draft Supplemental FWCA Report that addressed the Tier 2, Borgne storm surge protection barrier.

However, this report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. Furthermore, additional comments are provided in accordance with provisions of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). This report has been provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Marine Fisheries Service (NMFS); their comments will be incorporated into our final report.

## DESCRIPTION OF THE STUDY AREA

The IER 11 study area includes the Orleans East Bank, New Orleans East, and Chalmette Loop sub-basins along the east bank of the Mississippi River in Orleans and St. Bernard Parishes, Louisiana. Lake Pontchartrain borders the study area to the north. Reaches 148 and 147, and portions of Reach 146 of the LPV Hurricane Protection Levee (i.e., subsections of IER 10) that parallel the Mississippi River Gulf Outlet (MRGO) make up the study area's southern boundary. The eastern boundary extends along the eastern edge of Lake Borgne. The study area for Tier 2 Pontchartrain incorporates the section of the IHNC from the intersection of the de-authorized MRGO and the Gulf Intracoastal Waterway (GIWW) and to the west, and includes the IHNC lock complex to the south and the intersection of the IHNC and Lake Pontchartrain to the north.

Two areas have been selected as the preferred location for the storm surge protection barrier to protect the IHNC from storm surges coming from Lakes Pontchartrain and Borgne. The Borgne 1 location alternative, which would reduce storm surge from Lake Borgne and surrounding areas, extends from west of the Parish Road Bridge on the GIWW to east of the Michoud Canal on the GIWW and south of Bayou Bienvenue on the MRGO, and includes a portion of the emergent marsh area referred to as the "golden triangle." The other preferred location alternative is the Pontchartrain 2 barrier location alternative which extends from the Seabrook Bridge to 2,500 feet south of that bridge on the IHNC (Figure 1). The Pontchartrain 2 barrier location alternative would protect the IHNC against storm surge coming from Lake Pontchartrain. The Tier 2, Pontchartrain IER evaluates five alternative designs and alignments within the Pontchartrain 2 location alternative; this report focuses on that alternative location alignment.

Figure 1. Lake Pontchartrain and Vicinity (LPV), IHNC, Tier 2 Pontchartrain study area, Orleans and St. Bernard Parishes, Louisiana (IER 11).


## FISH AND WILDLIFE RESOURCES

Habitat types in the IER 11 study area include wet and non-wet bottomland hardwood habitat, early successional stage bottomland hardwood habitat (i.e., scrub-shrub), marsh, open water, and developed areas. Open water areas associated with the IHNC, GIWW, MRGO, Bayou Bienvenue, and interspersed open water areas within emergent marsh habitat make up a large portion of the study area. Due to urban development and a forced-drainage system, the hydrology of most of the forested habitat within the levee system has been altered. The forced-drainage system has been in operation for many years, and subsidence is evident throughout the areas enclosed by levees. Urban development and open water associated with the IHNC make up a significant portion of the Pontchartrain 2 barrier location project area. Minimal wetland habitats occur along the shoreline between the existing levee system and the waterway.

Wetlands (forested, marsh, and scrub-shrub) within the study area provide plant detritus to adjacent coastal waters and thereby contribute to the production of commercially and recreationally important fishes and shellfishes. They also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In addition, coastal wetlands buffer storm surges reducing their damaging effect to man-made infrastructure within the coastal area. Factors that will strongly influence future fish and wildlife resource conditions outside of the protection levees include freshwater and sediment input and loss of coastal wetlands. Regardless of which of the above factors ultimately has the greatest influence, emergent wetlands within, and adjacent to, the project area will probably experience losses due to subsidence, erosion, and relative sea-level rise.

The Service has provided FWCA Reports for the authorized hurricane protection projects. Those reports contain a through discussion of the significant fish and wildlife resources (including those habitats) that occur within the study area. For brevity, that discussion is incorporated by reference herein but the following information is provided to update the previously mentioned reports and provide IER specific information and recommendations.

The following is provided in accordance with the ESA of 1973, as amended. On December 6, 2007, the Service concurred with the Corps' determination that the proposed hurricane protection improvement project along the IHNC is not likely to adversely affect federally listed threatened and endangered species within our jurisdiction, including the pallid sturgeon (*Scaphirhynchus albus*), brown pelican (*Pelecanus occidentalis*), West Indian manatee (*Trichechus manatus*), and piping plover (*Charadrius melodus*), or its designated critical habitat. That concurrence was based on information provided to the Service in a November 7, 2007, letter which included the incorporation of the standard manatee protective measures into the Corps' construction contracts.

Your September 23, 2009, letter requested the Service's updated concurrence with the Corps' determination that project features associated with the proposed Pontchartrain 2 barrier system are not likely to adversely affect the West Indian manatee and the brown pelican. West Indian manatees, federally listed as an endangered species, occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). Manatee occurrences and their distribution appear to be increasing, as they have been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of Louisiana. They have also been occasionally observed elsewhere along the Louisiana Gulf coast and infrequently observed along the Texas Gulf coast. The manatee has declined in numbers due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these animals.

All contract personnel associated with project construction and operation should be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. All construction and operation personnel are responsible for observing water-related activities for the presence of manatee(s). Temporary signs should be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work area), and at least one sign should be placed where it is visible to the vessel operator. Signs should also be posted within work areas associated with operation of the flood control structures to ensure that operators are aware of the potential presence of manatee during the periodic closure of the structures. Siltation barriers, if used, should be made of material in which manatees could not become entangled, and should be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions should be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels should operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, should be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations would be resumed. Care should also be taken during the closure of the surge barrier structures to avoid entrapment of individuals. Any manatee sighting should be immediately reported to the Service's Lafayette, Louisiana Field Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821).

The Corps' concurrence request further ensures that the standard manatee protection measures will continue to be included in the Corps' construction contracts. Furthermore, the project area does not support nesting habitat for brown pelicans, and individual brown pelicans feeding and/or loafing in the project area are expected to avoid construction activity areas. The Service, therefore, concurs that the proposed project is not likely to adversely affect neither the West Indian manatee nor the brown pelican. No further endangered species consultation will be required for IER 11, IHNC, Tier 2 Pontchartrain, unless there are changes in the scope or location, or project construction has not been initiated within one year. If construction has not been initiated within one year, follow-up consultation should be accomplished with this office prior to making expenditures for construction.

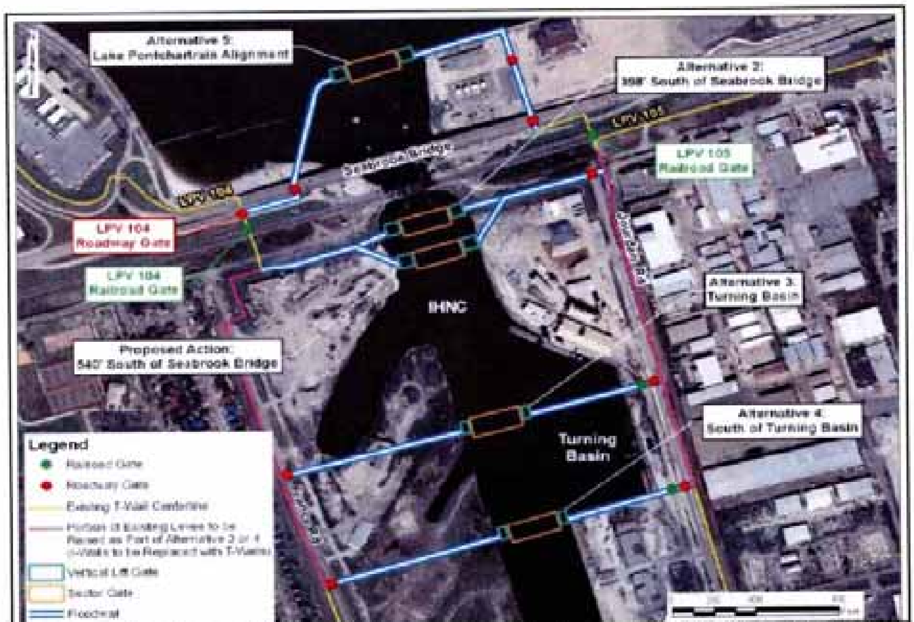
Potential changes in the status of federally listed threatened and endangered species, and possible additions to the Federal endangered species list are likely to occur. We recommend that the Corps' include in the operation and maintenance plan provided to the local sponsor a measure that will inform them of the need to coordinate with the Service and NMFS every year and when operational plans are revised, as those revisions may affect federally listed threatened and endangered species.

The threatened Gulf sturgeon (*Acipenser oxyrhynchus desotoi*), is known to occur in the study area. As you are aware, the National Oceanic and Atmospheric Administration's (NOAA), NMFS in St. Petersburg, Florida is responsible for consultations regarding impacts to the Gulf sturgeon and its critical habitat with the Corps in estuarine habitats, and as we understand the Corps is coordinating with that office.

Estuarine emergent wetlands, estuarine water column, and estuarine water bottoms within the project area have been identified as Essential Fish Habitat (EFH) for both postlarval, juvenile and sub-adult stages of brown shrimp, white shrimp, and red drum, as well as the adult stages of those species in the nearshore and offshore reaches. Commercially important estuarine and marine species such as red drum, spotted seatrout, Gulf menhaden, brown shrimp, and white shrimp are found in the project area. EFH requirements vary depending upon species and life stage.

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104-297) set forth a new mandate for NOAA's NMFS, regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. The EFH provisions of the Magnuson-Stevens Act support

Figure 2. IER 11, LPV, IHNC, Tier 2 Pontchartrain Alternative Alignments and Proposed Action.




http://www.nolaenvironmental.gov/ sec/projects/usace_levee/docs/original/IER11Tier2Pontchartrain090909.pdf

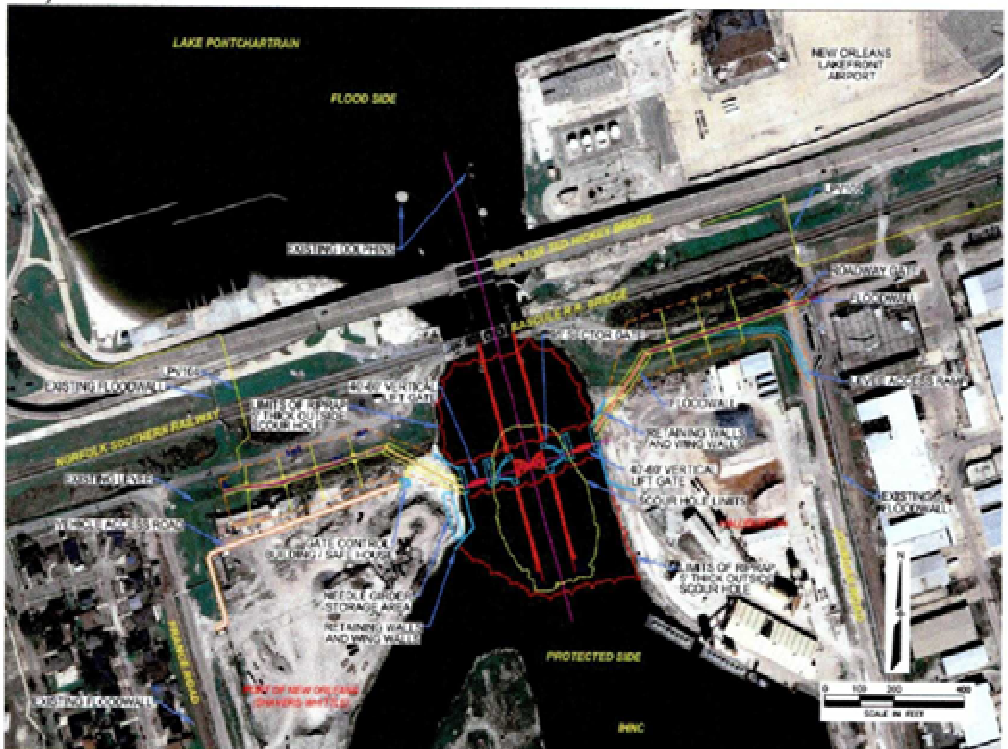
## DESCRIPTION OF SELECTED PLAN

The proposed alternative (i.e., Alternative 1, Figure 3) is the Bridgeside Alignment which includes a sector gate located 540 feet south of Seabrook Bridge and approximately 1,475 feet of T-walls built on existing levees. The features of the proposed alternative are as described above.

The proposed alternative alignment would also require filling in the existing south scour hole before commencement of construction of the cofferdam and foundation. The scour hole would be filled with coarse sand to an elevation of -42.0 feet NAVD 88 before the guide wall and supporting piling are driven. Stone riprap would be placed around the support piling to -37.0 feet NAVD 88. The IHNC in the project vicinity ranges from approximately -30 feet to -41 feet in depth outside the scour hole.

During construction, a temporary braced cofferdam would be installed across the channel around the approximate perimeter of the sector and vertical lift gates, closing this portion of the channel to navigation, recreational vessels, and aquatic organism access for the duration of the construction of the sector gate and vertical lift gates (i.e., for a period of approximately 12 months). The Corps determined that a bypass channel would be infeasible due to the potential for high flow rates and public safety concerns associated with navigating directly through an active construction area. Additionally, the construction sequence necessary to provide such bypass could potentially add approximately eight months to the construction schedule resulting in a cost increase.

Figure 3. IER 11, LPV, IHNC, Tier 2 Pontchartrain Proposed Alternative (i.e., Bridgeside Alignment) Features.




http://www.nolaenvironmental.gov/sec/projects/usace_levee/docs/original/IER11Tier2Pontchartrain090909.pdf

## FISH AND WILDLIFE CONCERNS IN THE STUDY AREA

Since 1930, Louisiana has lost over 1,500 square miles of marsh, and is still losing 25-30 square miles each year (LCWCR Task Force and WCR Authority 1998). Erosion, subsidence, and relative sea level rise continue to contribute to Louisiana's coastal land loss. The Lake Pontchartrain Basin is the largest contiguous estuary system along the Gulf Coast and is dominated by Lakes Pontchartrain, Maurepas and Borgne and their associated estuarine marshes and coastal forested wetlands. During the 1970's and 1980s, several studies and reports focused on the declining environmental state of the Lake Pontchartrain Basin caused by a number of factors including urban development, urban and agricultural runoff, poorly treated and untreated sewage, wetland loss, and salt water intrusion associated with the MRGO (Lake Pontchartrain Restoration Working 2009). The MRGO navigation channel was dredged through the Breton Sound Basin in 1963. Saltwater intrusion facilitated by the MRGO killed thousands of acres of freshwater wetland forests within the Lake Pontchartrain Basin and transformed intermediate and brackish marshes into more saline habitats. Wave-induced shoreline erosion associated with vessel traffic along the MRGO has further exacerbated marsh loss in the area.

Lake Pontchartrain itself has also fallen victim to the intrusion of higher saline waters from the MRGO. A 100-square-mile dead zone north of the IHNC in Lake Pontchartrain is the result of higher salinity and episodes of bottom water anoxia and hypoxia (Poirrier et al. 2008 and Day et al. 2008). Within this dead zone, a significant reduction of rangia clams, a filter feeder, has resulted in increased algae blooms, turbidity, and fecal coliforms, and as a result of increased turbidity the area has seen a reduction in submerged aquatic habitat. Historically the high density of rangia clams and clam shell hash has contributed to stabilizing the mud bottom and adjacent shoreline (Spalding et al. 2007). Rangia clams are also a good food source for fish, crabs, and waterfowl, and are the primary food source for scaup on Lake Pontchartrain. In 2006, the scaup population was estimated at 1.2 million on Lake Pontchartrain, a record high estimate in contrast to the year before (i.e., less than 1,000 scaup) which followed the 2005 hurricanes (Checkett 2006). The former highest record estimate was just under 500,000 scaup in 1981. Ducks Unlimited, Inc. biologists hypothesize that the increased numbers of scaup that year are a result of the very high production of Rangia clams (Checkett 2006).

In accordance with the Water Resources Development Act of 2007, approval by the Secretary of the Army and submittal of the June 5, 2008, Chief's Report to Congress by the Assistant Secretary of the Army de-authorized the MRGO channel from mile 60 to the Gulf of Mexico resulting in no further actions to maintain that portion of the MRGO navigation project. That Report authorized the closure of the MRGO with a plug, and in late July 2009 construction and complete closure was complete. The Tier 2, Borgne barrier structure which will reduce storm surges in the IHNC from Lake Borgne also includes an earthen plug on the MRGO further obstructing salt water intrusion through the Seabrook structure into Lake Pontchartrain. These recent actions are expected to further reduce salinity spikes through the IHNC and into the southern reach of Lake Pontchartrain, thus, reducing hypoxia and providing favorable conditions for the restoration of rangia clam habitat within Lake Pontchartrain. As a result it is expected that the benthic dead zone will see an increase in water clarity and quality, improvements to submerged aquatic vegetation and hard bottom reef habitat, and an over improvement to fish and wildlife habitat (Abadie and Poirrier 2001).

The Service strongly supports strategies and projects designed to address adverse impacts of continued coastal wetland loss and degraded fish and wildlife habitats. To comply with Section 303 (d) of Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), the Corps must implement and operate project features consistent with the Louisiana Coastal Wetlands Restoration Plan. That plan, developed by the Corps, the Service, and other Federal and State agencies, identified strategies to protect and restore Louisiana's coastal wetlands. Several Region 1 strategies include diverting Mississippi River water through Violet Canal to sustain the Central Wetlands and Biloxi Marshes, dedicated delivery of sediment for marsh building, as well as closure of the MRGO.

## POTENTIAL SIGNIFICANT IMPACTS

Direct impacts to emergent wetlands as a result of the proposed project are not anticipated.

Construction of the new structures across the IHNC would result in the loss of lower quality habitat associated with the banks of the IHNC and areas along the existing floodwall/levee. These areas are covered mainly by grass and are periodically mowed or are partially paved industrial areas. Temporary construction easements totaling approximately 26.5 acres and permanent easements totaling approximately 14.8 acres would be required resulting in a permanent loss of approximately 15 acres of open water and disturbed uplands.

**Direct Impacts**

The construction phase is expected to have the greatest direct impact on fish and wildlife resources and is anticipated to last approximately 18 to 45 months. Aquatic wildlife using open-water habitats in the project area are mobile and could move to similar habitats in the area at the start of construction activities. The cofferdam would temporarily impede movement and transport of aquatic organisms between the IHNC and Lake Pontchartrain for as much as twelve months, impacting at least one life cycle of aquatic organisms using that pass to reach the lower salinity waters of Lake Pontchartrain. This would affect populations of bait fishes (e.g., bay anchovy, Gulf menhaden and Atlantic croaker) and other commercially important species, such as blue crabs and shrimp species, which migrate inshore utilizing this passage. Although the Chef Menteur and the Rigolets Passes would remain open as access points for aquatic organisms to reach nursery areas in the lake, individuals that reach the IHNC would most likely not recruit to the lake due to poor water conditions in the IHNC during construction and the extended distance and time required to travel to an alternative access point. Commercial and recreational fishing activities would be significantly altered (e.g., displaced or discontinued) with possible economic affects during the twelve months the cofferdam is in place.

Once construction is complete, the IHNC surge barrier structure would reduce the width of the IHNC at the project location from 250 feet wide to 195 feet wide. Although the width of the channel will be reduced, hydraulic modeling conducted by the Corps has indicated that the proposed design including the vertical lift gates will result in velocities similar to those experienced historically within the IHNC. By maintaining those previous velocities the Corps expects that the design will provide adequate passage for fish and aquatic wildlife to cross the surge barrier except during gate closures. Gate closures are expected during storm events and monthly operation and maintenance activities and during high velocity periods to alleviate potential navigation hazards through the GIWW gate. Scheduled gate closure events are expected to last a few days each month. During these closures organisms would be prevented from passing between Lake Pontchartrain and the IHNC. It is uncertain as to the frequency and duration of these closures; therefore, anticipated impacts are unknown. If migratory patterns of fish and aquatic wildlife are not considered, the scheduling and timing of these gate closures could affect migration and transport of those resources.

Two scour holes, most likely the result of tidal flow into and out of the lake at the IHNC, are located approximately 300 feet north and south of the Seabrook Bridge. As a feature of the proposed project the south scour hole would be filled to the adjacent bottom elevation. The south scour hole is approximately 275 feet wide, 450 feet long, and 90 feet deep. Localized mortality of some individuals will occur as a direct result of the filling of the scour hole.

Siltation and diminished sunlight penetration would be most prevalent during the construction of the cofferdam and the filling in of the scour hole and would impact benthic aquatic organisms and phytoplankton in the area despite the use of Best Management Practices (e.g. silt curtains). Although some increased turbidity levels are expected for the duration of construction (i.e., up to 45 months) these increases would be less than turbidity level expected during filling of the scour hole and constructing the cofferdam.

Filling in the south scour hole may result in permanent beneficial changes to dissolved oxygen (DO) levels in the IHNC after construction is complete and has the potential to ultimately improve water quality conditions in the study area (Dortch and Martin 2008). This improvement in DO conditions is anticipated to be especially beneficial to Rangia clams and other benthic organisms.

**Indirect Impacts**

To assess potential indirect impacts to aquatic resources, the Corps reviewed scientific literature and conducted modeling of DO, salinity, velocity, fish passage, and Particle Transport Movement (PTM) for eight larval organisms (i.e., brown shrimp, white shrimp, blue crab, bay anchovy, Gulf menhaden, Atlantic croaker, red drum, and speckled seatrout) in the project area. The following discussion summarizes the results of those investigations.

The IHNC, a man-made channel with bulkheads along the shoreline, is one of three major tidal passages between the Gulf of Mexico and Lake Pontchartrain used by many aquatic species. Significant alterations to this tidal passage would cause positive and negative impacts to multiple organisms because the mechanisms that drive transport and migration would be altered. During the construction period, tidal flow would be obstructed impacting species such as blue crab, white shrimp and brown shrimp that are dependent on the tidal passes of this estuary to complete its life cycle. Once construction is complete, velocities similar to those experienced historically within the IHNC are expected to be maintained and provide adequate passage for fish and aquatic wildlife.

The installation of a cofferdam that will span the width of the channel would prevent velocity and circulation between Lake Pontchartrain and the IHNC for 12 months of the construction sequence. During the remaining 33 months of construction the IHNC will be at least partially open; velocities at the IHNC surge barrier structure are expected to remain below the existing conditions the majority of this time. However, hydrologic modeling conducted by the Corps' Engineer Research and Development Center (ERDC) indicates that velocities through the GIWW barge gate are expected to exceed 4.0 feet per second (fps) 30% of the time making maritime navigation difficult during construction of the IHNC surge barrier. Average velocities through the GIWW are estimated to be 3.0 fps during construction of the IHNC surge barrier. After construction is complete, velocities within the IHNC are expected to increase above existing conditions (i.e., the MRGO closure structure at Bayou La Loutre and Borgne Barrier), but comparable to those historically experienced prior to the above-mentioned structures being in place. Historical average velocities range from approximately 2.40 fps during the fall to 2.73 fps in the spring, with a maximum velocity of 4.98 fps (USACE 2009b). According to NMFS' guidance document titled "Fisheries Friendly Design and Operation Considerations for Hurricane and Flood Protection Water Control Structures," limited information indicates that velocities greater than 2.6 fps through tidal channels can inhibit fish passage and would cause even greater adverse impacts to less mobile aquatic organisms. However, this guidance may not necessarily be applicable to tidal passes or other similar major exchange points that naturally experience higher velocities. According to hydrologic modeling, velocities would exceed 4.0 fps in the IHNC 1% of the time under "September" modeling conditions and 3% of the time under "March" modeling conditions, and velocities exceed 2.6 fps in the IHNC 40% of the time under "September" conditions and 55% of the time under "March" conditions (USACE 2009a). The addition of the vertical lift gates on either side of the sector gate are expected to mitigate any turbulence caused by the sector gates. However, with the existing human alterations to the project area, fisheries resources are most likely already exposed to velocities greater than 2.6 fps during tidal cycles under existing conditions and occasionally are exposed to velocities similar to those predicted.

PTM modeling results indicate that the proposed action, in conjunction with the Lake Borgne surge barrier and the MRGO closure at Bayou La Loutre, may cause an overall 6% to 10% decrease in the dispersion of larval organisms into Lake Pontchartrain. Of the majority of the model fishery species that are recruited into Lake Pontchartrain via the IHNC those experiencing the greatest impact exhibit tidal lateral behavior during migration (e.g. brown shrimp, white shrimp, Gulf menhaden, Bay anchovy, and red drum). This predicted decline in recruitment could have some direct impacts to the overall population of these organisms because fewer organisms would occur in the system. Indirect impacts could be less prey available for seatrout and other predator fish if recruitment of shrimp and Atlantic croaker decline.

While the coffer dam is in place during the initial stage of construction, fish passage into Lake Pontchartain will be completely blocked. During this period all life stages of prey and predatory species using the IHNC as an access to the less saline estuarine habitats will be disrupted resulting in possible increased stress on individuals (e.g., starvation or increased predation pressure). The Corps' investigations determined that population-level impacts may be experienced if closure of the channel exceeds the maximum anticipated construction duration of up to twelve months. Once the cofferdam is removed, access to Lake Pontchartrain would be restored; however, based on the results of the PTM modeling, slowed velocities during phase II construction (i.e., coffer dam removed) along the GIWW and into the IHNC and changes in directional flow would increase migratory time to enter the Lake Pontchartrain through the IHNC potentially reducing recruitment of larval life stages of fisheries species.

Potential cumulative impacts to aquatic resources in the project vicinity could occur from construction-related activities (e.g., turbidity from dredging, noise) and from other on-going, completed, and authorized projects (e.g., changes in salinity, velocity, circulation/flow, and DO). Changes to hydrology may negatively affect fisheries resources during construction by decreasing recruitment of larvae especially tidal lateral movers such as shrimp, bay anchovy, Gulf menhaden, and red drum, and negative impacts could be exacerbated should the cofferdam be in place longer than 12 months. While blocked flow between the IHNC and Lake Pontchartrain may impact fish passage and tidal transport, salinities to the north and south of the project area would also change significantly during construction, potentially benefiting water quality parameters and benthic habitat. These alterations would include potential benefits to benthic communities in the southeastern portion of the lake, known as the benthic dead zone, and the temporary restoration of a natural salinity gradient in that area.

Modeling conducted by ERDC illustrated that the closure of the MRGO at Bayou La Loutre would have a significant effect on monthly average bottom salinity values not only in associated waterways, but also in the Lake Borgne area and in some areas of Lake Pontchartrain. Most areas showed decreases of 3 parts-per-thousand (ppt) to 4 ppt, with the MRGO showing the highest decrease of approximately 10 ppt in the region just north of the La Loutre closure, but minimal changes occur at Seabrook (< 1 ppt change) (Martin et al. 2009). The overall change to salinity could be both positive and negative to aquatic resources. It is expected that environmental conditions would be restored to those closer to historical conditions (e.g., pre-MRGO) including a more fresh-brackish water system. Although salinity would be returned to historic conditions, the area would experience a short-term reduction of prey species, changes in behavior, a decrease in growth rates, and a shift in species composition. While the initial impact may be substantial; it is expected to be beneficial in the long-term as the salinity regime is restored to somewhat historic conditions and the estuarine habitat becomes more productive. Restoring historic salinity conditions would be especially beneficial for benthic organisms that are currently experiencing poor DO and unfavorable salinity conditions within the bottom of the water column. Benefits may include increases in the populations of oysters and Rangia clams in Lake Pontchartrain and which in turn could assist in restoring historic submerged aquatic vegetation distribution within the lake. Other aquatic species using the areas would also benefit from improved water quality conditions.

While some areas may experience improved water quality conditions, there are other areas that may see a deterioration of water quality parameters as the salinity gradient shifts and recently constructed and authorized structures impede flow. Investigations are on-going to evaluate the cumulative impacts associated with the proposed project coupled with the Lake Borgne surge barrier structure, the MRGO de-authorization structure, as well as other projects proposed in the Lake Pontchartrain Basin.

As a result of the closure of the MRGO at Bayou La Loutre and the Lake Borgne surge barrier, organisms will no longer be able to use the MRGO and the western portion of the "golden triangle" marsh for transport or migration to Lake Pontchartrain. After construction, the IHNC via the GIWW and the Rigolets and Chef Menteur Passes in the eastern portion of the Lake would still be available. Even though larval transport and migration of other life stages may be reduced into Lake Pontchartrain through the IHNC, organisms could benefit from the overall change in flow direction from the implementation of closure of the MRGO, the Borgne Barrier, and the proposed action. If organisms used the alternate routes (i.e., the Rigolets and Chef Menteur Passes) they could enter and settle out in the eastern portion of Lake Pontchartrain, which contains more abundant high quality habitat, including natural shorelines bordered with complex habitat mosaics (SAV habitat, Rangia clams and oyster shells). Recruiting into these higher-quality habitats could result in higher growth rates, less predation, and a greater chance of individuals successfully growing to maturity and spawning. Such benefits would only occur if carrying capacity in those areas has not been reached resulting in additional pressure on resources due to competition and overuse.

For twelve months during construction a cofferdam will block flow between the IHNC and Lake Pontchartrain. Blocking access to quality habitat could cause an increase in predation of some lower trophic level species and change available prey items to predators. This blockage along with the Borgne Barrier and the MRGO closure at La Loutre may require predators that have become dependent on that tidal passage to travel longer distances during construction and would extend an already lengthy trip thereby decreasing growth rates, overall health, and possibly the ability to reproduce of some individual fisheries resources. Additionally, fish kills documented in the MRGO at the La Loutre closure coupled with potential fish kills at the Bienvenue closure and the IHNC during this period would impact a larger number of individuals. Fish kills in these areas could cause slower growth rates in individuals subjected to this environment, and would decrease survival of some species causing changes in overall community structure near the closures. Greater impacts are expected due to the MRGO closures due to the higher salinities and deeper water depth in the area as compared to the proposed action.

## FISH AND WILDLIFE CONSERVATION MEASURES

The Corps proposes to close the Lake Pontchartrain surge barrier during storm events and monthly maintenance events, and during periods of high velocities to ensure safe navigation through the GIWW structure. The definition of a storm event and velocity threshold that will require gate closures has not been provided. The frequency, timing, and duration of these events are also unknown, and depending on the operation of these closures, aquatic organisms could be adversely impacted. To minimize impacts and reduce the amount of closures, maintenance events should capitalize on closure events resulting from increased velocities. In the event this is not feasible, an effort to time closures during the two lowest tidal periods during a month would minimize impacts to fisheries migration and flow. To further minimize impacts, the closure of the IHNC surge barrier to alleviate high velocities through the GIWW should be carefully evaluated. A minimum channel reduction necessary at the IHNC surge barrier that will allow safe navigation at the GIWW gate and provide some aquatic organism access should be considered. The Service and other natural resource agencies should be provided an opportunity to review and comment on the timing and duration of the proposed closure events to further minimize their effects.

The IHNC hurricane protection project, including both the Lake Borgne and Lake Pontchartrain surge barriers, is expected to impact tidal exchange, minimize the channel cross sectional areas and geomorphology, and aquatic organism access. Operational plans and final design configurations should be developed to maximize the cross-sectional area. The Corps should coordinate with the natural resource agencies during ongoing development of the structure designs to ensure that fish and wildlife conservation measures are incorporated. Furthermore, NMFS' guidance document titled "Fisheries Friendly Design and Operation Considerations for Hurricane and Flood Protection Water Control Structures" provided in our November 26, 2007, Draft Programmatic FWCA Report and also included in this Report (Appendix B) should assist in the design of flood protection features while incorporating estuarine habitat conservation measures.

The Corps has provided valuable insight into the potential impacts associated with the proposed project through their extensive modeling and investigations which has also benefited other proposed projects in the basin. To fully evaluate and disclose impacts associated with the construction and operation of the IHNC hurricane protection project, the Corps should continue to move forward with those modeling efforts and investigations. The Cumulative Environmental Document should fully describe the cumulative impacts of the IHNC hurricane protection project structures and the operation of those structures including impacts to water quality, aquatic organism access, and how those impacts relate to current and foreseeable projects in the area.

## SERVICE POSITION AND RECOMMENDATIONS

The Service does not object to the construction of the proposed project provided the following fish and wildlife conservation recommendations are implemented concurrently with project implementation:

1. Generally, flood protection barriers and associated structures should be situated so that destruction and enclosure of emergent wetlands are avoided or minimized, to the greatest extent possible.

2. The project's first Project Cooperation Agreement (or similar document) should include language that specifies the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features, as well as shoreline protection features.

3. Further detailed planning and design of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LDWF, Environmental Protection Agency (EPA) and Louisiana Department of Natural Resources (LDNR). The Service shall be provided an opportunity to review and submit recommendations on the all work addressed in those reports.

4. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with each office (i.e., NMFS in St. Petersburg, Florida, and the Service's Lafayette, Louisiana, Field Office) to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

5. Operation and maintenance plans should inform the local sponsor of the potential for federally listed threatened and endangered species to occur near the proposed structures

and the need be aware of their presence during operation of those structures. We recommend that the Corps' include in the operation and maintenance plan provided to the local sponsor a measure that will inform them of the need to coordinate with the Service and NMFS every year and when operational plans are revised, as those revisions may affect federally listed threatened and endangered species.

6. To ensure manatees are not entrained within the flood protection structures or harmed during the closure of the structures, Standard Manatee Protection Measures should be included in the Corp's construction contracts as well as the operation and maintenance plans developed for the local sponsor.

7. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.

8. Flood protection water control structures should remain completely open except during storm events and should be operated to allow for maximum flow. The development of the operation and maintenance plans should be closely coordinated with the natural resource agencies to ensure maintenance events are scheduled to minimize impacts to aquatic resources.

9. To the maximum extent practicable, monthly maintenance activities should coincide with closure events intended to reduce velocities for the maritime industry. In the event this is not feasible, closures should be timed during the two low periods of the tidal range during a month to minimize impacts to fisheries migration and flow.

10. Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

11. To the maximum extent practicable, structures should be designed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet/second. This may not necessarily be applicable to tidal passes or other similar major exchange points.

12. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

13. Operation and maintenance plans should be developed to maximize the cross-sectional area open for as long as possible and should be coordinated with the natural resource agencies. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

14. Shoreline protection features should be constructed as proposed to maintain the shoreline integrity and minimize shoreline erosion.

Should you or your staff have any questions regarding this letter and our attached report, please contact Angela Trahan (337/291-3137) of this office.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

cc: Southeast LA Refuge Complex, Lacombe, LA
NMFS, Baton Rouge, LA
EPA, Dallas, TX
LDWF, Baton Rouge, LA
LDWF, NHP, Baton Rouge, LA
LDNR, CMD, Baton Rouge, LA
OCPR, Baton Rouge, LA

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## APPENDIX A

National Marine Fisheries Service Baton Rouge Field Office

Recommendations for Fisheries Friendly Design and Operation of Hurricane and Flood Protection Water Control Structures and Supporting Appendices


SUMMARY

The purpose of this document is to: 1) identify design and operational guiding principles that would optimize passage of estuarine dependent marine fisheries species, or at least, minimize adverse impacts to their passage through hurricane and flood protection water control structures planned for the New Orleans District of the U.S. Army Corps of Engineers; and, 2) provide background literature for environmental justification and documentation. Specific projects for which this guidance should be considered include the Mississippi River and Tributaries, Morganza to the Gulf of Mexico Hurricane Protection Project; Donaldsonville to the Gulf Project; Supplemental Appropriations Projects, and the Louisiana Coastal Protection and Restoration Project (LACPR). However, these guiding principles would also pertain to any civil works projects that could include combinations of levees and/or water control structures. Project delivery teams should remain flexible to adapt these design principles on a case-by-case basis as new fishery resource information and project-specific hydraulics data become available.

In general, the ability of estuarine dependent marine fishery organisms to migrate to and from coastal habitats decreases as structural restrictions increase, thereby reducing fishery production. The physical ability (i.e., swimming speed) to navigate through a structure is not the only factor influencing fish passage. Both behavioral and physical responses govern migration and affect passage of fishery organisms through structures. These responses may vary by species and life stage. In addition, most marine fishery species are relatively planktonic in early life stages and are dependent on tidal movement to access coastal marsh nursery areas. For this reason, in general, the greater the flow through a structure into a hydrologically affected wetland area, the greater the marine fishery production functions provided by that area.

Data on marine fishery species migrations in the Gulf of Mexico are too limited to allow the development of definitive design and operational considerations for water control structures that would guarantee the protection of marine fishery production. Anecdotal comparisons can be made with data from water intake and fish passage studies from the west and east coasts. It should not be assumed that structures that have been determined to provide sufficient drainage capacity also optimize or provide adequate fishery passage. More investigation is warranted to refine and adaptively manage water control structure design and operations to minimize adverse impacts to fishery passage. Case specific recommendations for some features under the Mississippi Tributaries, Morganza to the Gulf of Mexico Hurricane Protection Project and LACPR are provided in the appendices. In addition, biological background information is provided in the appendices to assist in preparation of environmental documents required by the National Environmental Policy Act (NEPA).

Summary of guiding principles for designing and operating flood protection water control structures to maintain marine fishery passage:

- Generally, bigger and more numerous openings in hurricane and flood protection levees better maintain estuarine dependent fishery migration. As much opening as practicable, in number, size, and diversity of location should be considered.
- Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.
- Flood protection water control structures should remain completely open except during storm events.
- Any flood protection water control structure sited in canals, bayous, or navigation channels that do not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.
- The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.
- Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.
- To the maximum extent practicable, structures should be designed and/or culverts selected such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet/second. This may not necessarily be applicable to tidal passes or other similar major exchange points.
- To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.
- Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and at natural stream crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500-feet long and an area would hydrologically isolated without that culvert.
- Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.
- Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.
- Operational plans should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

## Introduction

Various flood protection and environmental water control structures in hurricane protection levees are being designed and considered for inclusion with ongoing local and federal civil works projects within the boundaries of the New Orleans District. Design purposes of the structures vary and may include maintaining safe navigation and optimizing drainage and passage of fishery organisms. For the Morganza to the Gulf of Mexico hurricane protection project, an interagency Habitat Evaluation Team (HET) and NOAA's National Marine Fisheries Service (NMFS) identified economically important fishery species that should be considered when assessing structure impacts on estuarine fisheries migration. Both the federal and state governments manage some of these species. Primary species that could be affected by flood protection structures in Louisiana include brown shrimp, white shrimp, blue crab, red drum, black drum, spotted seatrout, sand seatrout, southern flounder, and gulf menhaden. Some information is included herein on forage species, the production of which is important to maintain as they serve as important links of the aquatic food web for many of the managed fishery species.

The Baton Rouge office of NMFS has developed preliminary design principles for hurricane and flood protection water control structures to reduce impacts to living marine resources, especially related to migrations of estuarine dependent species. The basis for the following recommended guiding principles is briefly discussed where supporting literature is available. Case specific examples for some features under the Mississippi River and Tributaries, Morganza to the Gulf of Mexico hurricane protection project and the Louisiana Coastal Protection and Restoration Project are provided in the appendices. Basic behavior and physiology effects on the passage of fishery organisms are discussed in detail in appendices C and D, to aid federal agencies in environmental evaluations and descriptions under NEPA.

This document has been developed in consideration of input from the interagency HET, university faculty, fish passage staff of various agencies, and cursory literature reviews. These design considerations are intended to address potential impacts to living marine resources pursuant to the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act. Impacts to resources managed under other authorities, such as the Endangered Species Act or the Marine Mammal Protection Act, are not addressed in this document.

## BEHAVIOR

The physical ability (i.e., swimming speed) to navigate a structure is not the only factor influencing fish passage, especially for small structures. Behavioral responses to stimuli individually or interactively affect passage with physiological constraints or responses. Behavior generally can be categorized as schooling and non-schooling behavior.

### Schooling Behavior

Schooling behavior consists of strategies that provide hydrodynamic efficiency, reduced predation, increased efficiency in finding food, and increased reproductive success. Water control structures for flood protection impact large numbers of fishery organisms due to this group response. This could be because fish exhibit the tendency to approach and orient to other members of the species (i.e., biotaxis). This orientation confers a hydrodynamic advantage that is more efficient than individuals due primarily to vortices setup by lead fish. Schools function as a living organism where the group reacts to stimuli as an individual. It is this group reaction that influences greater affect on passage through water control structures.

#### NON-SCHOOLING BEHAVIOR

Agonistic, territorial, and hierarchical behaviors are examples of non-schooling behavior exhibited by fish. Agonistic and territorial behaviors are largely unknown for the listed estuarine and marine fishery species of concern and their life stages. Structures that create physically taxing water flow velocities and some low flow areas may encourage these behaviors as fish compete for resting areas similar to competition seen with fish competing for resting areas within shrimp trawls or behind rocks in river riffle/pool habitat. It is possible these behavioral responses overall may not be that influential on fish passage through a structure, but may come more into play during low flow conditions such as lower tides or slack tide. Hierarchical behavior can often be driven by a combination of physiological responses and will be discussed in that section. Overall, investigation on behavioral responses to water control structures is needed to avoid and minimize adversely impacting fishery passage if not optimizing it.

### PHYSIOLOGICAL

Fishery species and life stages react differently to a current of water (i.e., rheotaxis). Generally, fish are better able to orient to horizontal verses vertical flow (Meyers et al. 1986).

#### Locomotion

There are two means for migratory transport of estuarine and marine fish and crustaceans: passive and active transport. Passive transport is drift of organisms carried by the tides and currents. Larval and post-larval fish and crustacean life stages are predominately transported passively by tides and currents. Passive transport via tidal forcing can play a strong role in migration of sub-adult and adult brown shrimp, white shrimp, and blue crabs. Active transport is movement by swimming, which is the primary means of locomotion for sub-adults and adult fish.

#### SWIMMING SPEED

Refer to guiding principles number 7 for details on swimming speeds relative to impacts on fish passage.

#### BEHAVIORAL/PHYSIOLOGY INTERACTION

Many fishery organisms exhibit hierarchical behavior. This is a direct response to stimuli, such as astronomical (e.g., tidal rhythm) or meteorological driven flows. For example, brown shrimp mediate transport by circadian or diel vertical migration. Brown shrimp move down in the water column or cease activity as the become negatively buoyant when low salinity and temperature water develop in estuaries with north winds associated with spring fronts. Brown shrimp activity resumes with their movement up in the water column with increasing water temperature, salinity, and hydrostatic pressure associated with the southerly gulf return following after a cold front

(Rogers et al. 1993). Similar selective tidal stream transport was reported by Hartman et al. (1987). Fishery organisms identify tide changes by detecting altered velocity, salinity, temperature, all of which can cue staging for immigration with an incoming tide. Future tidal pass or inlet studies are needed for better information on vertical distribution, depth preferences, and changes in buoyancy or behavior to evaluate active and passive transport of fishery organisms.

## GUIDING PRINCIPLES FOR DESIGNING FISHERIES FRIENDLY FLOOD PROTECTION WATER CONTROL STRUCTURES

**1. Generally, bigger and more numerous openings in hurricane and flood protection levees better maintain estuarine dependent fishery migration. As much opening as practicable, in number, size, and diversity of location should be considered.**

Most of Louisiana's commercial and recreational fishery species must have access to estuarine marshes to successfully complete some part of their life cycle (i.e., they are estuarine-dependent). Estuarine-dependent fishery productivity is a measure of standing crop (the number of fishery organisms present at a point in time) and the turnover rate (the rate at which the population is replaced). All things being equal, fishery production would be lower following levee and water control construction if structures retard turnover rate. This would be the case even while standing crop may appear normal. Restrictions in tidal movement caused by water control structures and levees would result in degraded or substantially changed species composition, which could alter fishery production and/or displace fisheries.

Marine transient species emigrate (i.e., move from coastal marshes towards Gulf waters) towards higher salinity water; therefore, a structure that maintains the greatest degree of opening while allowing the project objectives to be met would be desirable (Rogers et al. 1992).

**2. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.**

Water control structures should be designed to have a water flow capacity (and similar dimensions where possible) comparable to the waterway before construction. Restricted water exchange in marshes enclosed by levees and water control structures diminishes recruitment and standing stocks of species that must migrate from coastal spawning sites to marsh nurseries (Rogers et al. 1994). As the amount of hydrologic control increases, the effect on migration and production of marine transients and residents increases. Greater restriction decreases turn over rate of estuarine-dependent fishery organisms, which decreases their production (Rogers et al. 1992[a] ). Slotted and fixed crest weirs have been found to delay immigration. As the degree of restriction increased from slotted weirs, to low elevation weir, and to fixed crest weirs, greater impacts to different fisheries species and their emigration were observed.

Design considerations for hurricane and flood protection water control structures should include features to accommodate vertical and horizontal fishery distribution patterns within interior marsh tidal pathways and coastal passes. Fishery organisms exhibit preferences by species, life stage, and in some cases tide cycle, for vertical and horizontal distribution within smaller or interior marsh tidal connections (Table 1). Behavioral and physiological responses, such as diel vertical migration, affect these preferred distribution patterns.

Study of Keith Lake Pass in Texas revealed that all portions of the water column, both vertically and horizontally, are used by fishery organisms (Hartman et al. 1987). Most estuarine-dependent fishery species preferred the bottom or shore zones during flood tides, but were much denser near the shores of the pass, in slower moving water, on ebb tide. This lateral movement on slack to ebb tides appears to be a behavioral action to prevent displacement from the pass during ebb tide to accelerate movement to marsh nursery areas. The study identified the response to light cycles with midday densities greatest at bottom and densities greatest at surface during dawn to dusk. Similar within pass distribution patterns were reported by Sabins and Truesdale at Grand Isle, Louisiana (1974) .

Table 1. Table on fishery preference within the water column (Marotz et al. 1990; Herke and Rogers 1985; Hartman et al. 1987; Sabins and Truesdale 1974). "a" denotes juveniles; "b" denotes immigrating; "c" denotes emigrating; "e" denotes ebb tide; "f" denotes flood tide.

| | Vertical Distribution | | | Horizontal Distribution |
|---|---|---|---|---|
| Species | Surface | Mid-depth | Bottom | Shore/Nearshore |
| brown shrimp[b] | X | X | | X[e] |
| white shrimp[b] | X | X | | |
| white shrimp[c] | | X | | X[e] |
| blue crab | X | | | Xe |
| red drum[a] | | | | X[e] |
| red drum[b] | | X | X | |
| red drum[c] | | | X | |
| bay anchovy | X | | | |
| striped mullet | X | | | |
| Atlantic croaker[a] | X | X | | X[e] |
| Atlantic croaker | | X | X | X[e] |
| spotted seatrout | | X | X | |
| sand seatrout | | X | X | X[e] |
| gulf menhaden | X | X | | |
| southern flounder | | | | X[f] |
| black drum | | | | X[e] |

**3. Flood protection water control structures should remain completely open except during storm events.**

Fish passage should be optimized by the duration that structures remain fully open. Rozas and Minello (1999) reported that even when water-control structures were open, the densities of transient species were low inside areas enclosed by levees and water control structures as compared to natural areas.

Fisheries migration that temporarily may be impacted with storm related closures are listed in Table 2. The degree of impact would be influenced by the timing and duration of a structure closure relative to peak migration.

Table 2. Migration of economically important fisheries in Louisiana that temporarily may be impacted with storm related closures.

| Species | Migration Period Overlapping with Hurricane Season |
|---|---|
| brown shrimp | April - mid July |
| white shrimp | July – November |
| blue crab | June – September |
| spotted seatrout | April – October |
| sand seatrout | April – October |
| red drum | August - December |
| black drum | March – July |
| southern flounder | September - October |

**4. Any flood protection water control structures sited in canals, bayous, or navigation channels that do not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.**

Hartman et al. (1987) recommended structures not be constructed in a tidal pass. If a structure was constructed, they recommended the incorporation of several gates at several vertical and horizontal locations, with baffles near shore. Baffles near shore are to direct shore or near shore fish passage on ebb tides through the available structure opening(s) (e.g., gates in wing walls).

Structures should be designed and operated with multiple openings if the pre-project water depth and widths of a channel are not maintained. Multiple openings are necessary to optimize passage of fishery organisms that prefer to migrate along the sides, bottom, and top of channels. For example, Rogers et al. (1992[a]) recommended opening some vertical slots and top, middle, and bottom gates in a structure with multiple slots and gates.

**5. The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.**

The location and number of structures likely affects the abundance and distribution of estuarine fishery species within habitats that would be located on the protected side of levees and water control structures. Rogers et al. (1992[c]) determined that marine transient species were most numerous nearest the structures, partially due to the proximity of the openings with respect to the area enclosed. Similarly, other studies have shown there is a decrease in fishery species abundance and diversity the greater the distance from the access point (Peterson and Turner 1994). This can become more pronounced if an environmental gradient (e.g., salinity) exists between an access point and the interior habitat located on the protected side of structures (Cashner 1994).

**6. Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.**

Study of Keith Lake Pass in Texas revealed vertical and horizontal distribution patterns of fishery organisms in the pass (Hartman et al. 1987). Estuarine-dependent fishery organisms preferred the bottom or near shore zones on flood tides. Most organisms appeared near shores of the pass on ebb tide in slower moving water. Baffles near shore are to direct shore or near shore fish passage through the structure.

Many fish migrate along the water bottom. Water control structures with crests or inverts higher than the lower portion of a channel could impede migration through the deep-water portions of channels. Ramps can provide a means to guide organisms over and through structures and increase access of fisheries organisms to enclosed habitat (Lafleur 1994). Various ramp designs need to be investigated.

**7. To the maximum extent practicable, structures should be designed and/or culverts selected such that average flow velocities during <u>peak</u> flood or ebb tides do not exceed 2.6 feet/second.**

In this preliminary investigation, no studies were located that evaluated the impacts of swimming speeds for the fishery species and life stages of concern in Louisiana. To avoid preventing or reducing ingress or egress of fishery organisms, preliminary guidance on water velocities through structures in Louisiana could be based on anecdotal comparisons with data available on general swimming speeds from studies on the west and east coasts (Tables 3 and 4).

Swimming speeds of estuarine and marine fish and crustaceans is a function of shape, stage of development, length, ambient temperature, light, and duration required for swimming performance. For most species, absolute speed increases as size increases. Generally, fish swimming speeds range from 2-4 body lengths/second with burst speeds up to 5 body lengths/second (Meyers et al. 1986).

Water intake studies have shown that maintaining water velocities less than 0.5 ft/sec would protect most fish and their life stages from being adversely affected by those flows (USEPA 2004). The species and life stages of fish for that study could not be located at this time and further investigation for Gulf of Mexico species is warranted. They also recommended creating horizontal velocity fields to avoid adverse affects on fish because fish are better able to orient to horizontal verses vertical flow. This could allow selective avoidance of water flows not preferred by fish or minimize disorientation or mortality rates caused by flows.

Eberhardt (personal communication) reported velocities exceeding 0.82 feet/second began to impede fish passage. Fish passage was decreased by 50% for velocities exceeding 2.6 feet/second. Based on evaluation of freshwater species, Gardner (2006) recommends keeping velocities through round culverts less than 1.8 ft/sec during 90% of the fish migration season. To improve fish passage through culverts, installing baffles within culverts should be considered to reduce flow velocity barriers for fish (Pacific Watershed Associates 1994).

Table 3. Water flow velocity thresholds for affecting fish passage or avoiding impingement within flows or on screens.

| Source | Water Flow Velocity (ft/sec) | |
|---|---|---|
| Alyson Eberhardt, personal communication | 0.82 | Begin to impede |
| | 2.62 | Decreased fish passage by 50% |
| Gardner 2006 | 1.8 | Critical velocity (freshwater fish) |
| Meyers et al. 1986 | <0.49 | To avoid impingement |
| USEPA 2004 | <0.50 | Protected 96% of the fish tested from impingement |

Table 4. Sustained fish swimming speeds. Adapted from Meyers et al. (1986). Note that no data was located for the fisheries species and life stages for the Gulf of Mexico.

| Fish/life stage | Swimming Speeds (ft/sec) |
|---|---|
| Atlantic herring | 0.19 – 0.3 |
| Mullet | 4.19 |
| Horse mackerel | 4.46 |
| Sole | 0.19 - 0.3 |
| most larvae | 0.82 – 0.98 |

Based on these limited data, larval fish could be adversely impacted by water flow rates exceeding 0.82 feet/second. Post-larval and juvenile stages of flounders could be impacted by flow rates around 1.0 ft/sec. Other species or larger life stages likely would not be adversely impacted until flow rates exceed 2.62 feet/second based on inferences from these data. Water flow velocity monitoring in the Terrebonne Basin by the U.S. Fish and Wildlife Service has found maximum flows through existing open channels exceeding 1.0 feet /second and in larger saline marsh channels and passes exceeding 2.0 feet/second.

If the spatial extent of flow velocity fields exceed the distance that can be traveled with sustained or burst swimming speeds of fishery organisms, those flows could prevent or reduce ingress or egress during the time which those flows exist. However, the degree of mortality from not being able to access nursery and foraging habitat is not known. High flow rates may aid passage of larval fish that primarily depend on passive transport for migratory distribution and access to estuarine habitat on the protected side of levees, if the high flows do not induce mortality from injury or fatigue. Water flow could exceed the fish swimming rates for short periods and still provide passage during low flows or during still water.

**8. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.**

Design considerations should include installing baffles within culverts to reduce flow velocity barriers (Pacific Watershed Associates 1994). Passage of salmon and herring species has been shown to be impaired by culverts. With baffles or other similar features, still water areas could be created to enhance fish passage.

If water control structures include plunge pools, the invert elevation of the structure could be equal to the depth of the plunge pool if the plunge pool is deeper than the pre-project water depth. This deeper invert would optimize passage of fisheries species, in particular bottom dweller species.

Fish often require visual cues for orientation and exhibit faster swimming speeds at increased light levels. Herring type fish (e.g., gulf menhaden) are particularly sensitive to light levels. However, although herring exhibited a preference for unshaded portions of treatments during both day and night periods, as little as 1.4% of the ambient light was necessary for their passage through a culvert (Mosser and Terra 1999).

**9. Culverts should be installed in construction access roads unless otherwise recommended by the resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and at all water crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary, even if the road is less than 500 feet long, if an area would be hydrologically isolated without that culvert.**

**10. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after storm passage and return of normal water levels.**

Regardless of structure size, designs and contingency plans should include means to rapidly open the water control structures when flooding risks subside after a storm. Designs and plans should include infrastructure, equipment, and staff necessary to open the structures even if offsite electricity is not available. Design safeguards should be developed to protect the structures from being damaged rendering them inoperable and locked in a closed configuration after passage of a storm.

**11. Levee alignment and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.**

**12. Operational plans should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.**

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## APPENDIX B

Reference Websites, Fish Passage Agency Representatives, and University Faculty

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USACE Portland District, Fish Passage Team
http://www.nwp.usace.army.mil/pm/e/en_fish.asp

USACE, ERDC, Coastal Hydraulics Lab
http://chl.erdc.usace.army.mil/CHL.aspx?p=s&a=ResearchAreas;22

USFWS Fish Passage Decision Support System
http://fpdss.fws.gov/index.jsp

NC State's Center for Transportation and the Environment website:
http://www.itre.ncsu.edu/

http://itre.ncsu.edu/CTE/gateway/downloads/Culvert%20Impact%20Study(December2002).pdf

http://itre.ncsu.edu/CTE/gateway/downloads/FishPassage.pdf

FishXing software and learning systems for fish passage through culverts. This software is intended to assist engineers, hydrologists, and fish biologists in the evaluation and design of culverts for fish passage. It is free and available for download.
http://stream.fs.fed.us/fishxing/

- Allows for comparison of multiple culverts designs within a single project.
- Calculates hydraulic conditions within circular, box, pipe-arch, open-bottom arch, and embedded culverts.
- Contains default swimming abilities for numerous North American fish species.
- Contains three different options for defining tailwater elevations.
- Calculates water surface profiles through the culvert using gradually varied flow equations, including hydraulic jumps.

- Outputs tables and graphs summarizing the water velocities, water depths, outlet conditions, and lists the limiting fish passage conditions for each culvert.

USFWS Fish Passage National Coordinator
thomas_sinclair@fws.gov

NOAA, NMFS
Eric.Hutchins@noaa.gov
James.G.Turek@noaa.gov
Richard.Wantuck@noaa.gov

Louisiana State University Coastal Fisheries Institute
Jim Cowan; jhcowan@lsu.edu
Bruce Thompson; coetho@lsu.edu

University of Texas Marine Science Institute
Lee Fuiman; lee@utmsi.utexas.edu

APPENDIX C

September 23, 2009, Endangered Species Act Concurrence Request

DW

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

RECEIVED
SEP 28 2009
FISH & WLDL. SERV
LAFAYETTE, LA.

REPLY TO
ATTENTION OF

September 23, 2009

Planning, Programs, and
Project Management
Environmental Planning and
Compliance Branch

James Boggs
Field Supervisor
U.S. Fish and Wildlife Service
646 Cajundome Blvd - Suite 400
Lafayette, LA 70506

Dear Mr. Boggs:

Attn: Angela Trahan

Provided for your review are the project description, project location map, and determination by the U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN) of the effect that the proposed action would have on threatened and endangered (T&E) species under USFWS jurisdiction. The proposed action, referred to as Improved Protection on the Inner Harbor Navigation Canal (IHNC) – Seabrook Floodgate Structure, is part of the Lake Pontchartrain and Vicinity (LPV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) for Orleans Parish, Louisiana. Its environmental impacts are assessed in Individual Environmental Report # 11 (IER # 11) Tier 2 Pontchartrain. This IER will be completed in the next few months and will be forwarded to you upon completion.

***PROJECT DESCRIPTION***

The proposed action is located in Orleans Parish, Louisiana. The proposed action would provide 100-year level of risk reduction for Orleans Parish. IER # 11 Tier 2 Pontchartrain evaluates the proposed construction of a storm surge risk reduction structure on the IHNC near its connection to Lake Pontchartrain (figure 1). Specifically, the proposed action consists of a steel sector gate and two flow augmentation gates (vertical lift gates) to be built 540 ft south of the Senator Ted Hickey Bridge (also referred to as the Seabrook Bridge) in the IHNC. It also includes T-wall floodwall tie-ins and a roadway gate. A site plan of the proposed action is shown in figure 2.

A steel sector gate would be built with a top-of-gate elevation of +18.0 ft NAVD88 and a sill elevation between -16.0 ft and -20.0 ft. The sector gate would have a 95-ft-wide navigation opening, which is the width of the existing navigation channel, and concrete dolphins. The two vertical lift gates would be installed on either side of and adjacent to the sector gate. The vertical lift gates are necessary to maintain existing flow velocities through the sector gate since higher velocities would make navigation through the sector gate difficult (and potentially unsafe) and also could cause problems for fish migrating through the gate. The lift gates would each have a width of between 40 ft and 60 ft and sill elevations between -10.0 ft and -20.0 ft NAVD88. The tops of the lift gates would be flush with the adjacent sector gate at El +18.0 ft NAVD88.

T-walls placed on the existing levees would be built to EL +16.0 ft NAVD88. They would connect the western earthen levee to LPV 104 at elevation +16.5 ft NAVD88 and the eastern levee to LPV 105 at elevation +15.5 ft NAVD88. The floodwall on the east side of the channel would include a 20-ft-wide vehicle slide gate with a sill at existing ground elevation to provide access to Jourdan Road. On the western side of the IHNC, approximately 700 ft of T-walls built on the existing levee would tie-in the floodgates to the existing LPV 104 floodwall at EL +16.5 ft NAVD88. T-wall tie-in sections built to elevation +16.0 ft NAVD88 would be required to connect the gate structures in the IHNC to the T-walls built on existing levees on either bank of the IHNC. T-walls would be placed on the backfill and founded on sheetpiles. A 20-ft-wide roadway at the toe of the wall would provide for vehicular access to the either side of the sector gate structure. The proposed alignment centerline crosses properties owned by the Port of New Orleans.

The proposed action would encroach into a scour hole in the IHNC located approximately 300 ft to the south of the Seabrook Bridge. The hole is approximately 275 ft wide by 450 ft long by 90 ft deep and likely resulted from tidal flow into and out of the lake. The scour hole would be filled in before construction of the cofferdam and foundation. The scour hole would be filled in to provide frictional resistance for the pile foundation, help relieve pore water pressure during pile driving, and minimize turbidity in the IHNC. The lower portion of the scour hole would be filled with coarse sand to El -42.0 ft NAVD88 before the guide wall and supporting piling are driven; then, stone riprap would be placed around the support piling to El -37.0 ft NAVD88. The IHNC in the project vicinity ranges from approximately -30 ft to -41 ft in depth outside the scour hole.

During construction, a temporary, braced cofferdam would be installed across the channel, encompassing the approximate perimeter of the sector gate and vertical lift gates and remain in place for a period of approximately 6-12 months. This portion of the channel could be closed to navigation and recreational vessels for the duration of the construction of the sector gate and vertical lift gates, depending on design and construction techniques.

A control building also would be constructed to house a safe room area, standby generators, power distribution, and programmable logic controller communications/monitoring system for the gates. This hurricane-proof structure would have a 15-ft by 30-ft footprint and would be located on the protected side, to the west of the western vertical lift gate structure near the east end of the west bank floodwall. The control building would be accessible by a vehicle access drive for refueling, operation, and maintenance purposes. In order to design and construct the proposed action, permanent easements totaling almost 15 acres and a temporary work area easement of about 26 acres would be required (see figure 3).

***CEMVN DETERMINATION OF IMPACTS TO T&E SPECIES***

CEMVN has assessed the environmental impacts of the proposed action on T&E species in the project vicinity. In a previous consultation letter to CEMVN dated February 2, 2009 (USFWS 2009), USFWS discussed two Federally listed species under its jurisdiction that potentially could occur in the IER # 11 Tier 2 – Pontchartrain project area: the endangered West Indian manatee (*Trichechus manatus*) and the endangered brown pelican (*Pelecanus occidentalis*). In that letter, which was based on preliminary plans for the IER # 11 Tier 2 – Pontchartrain project and also addressed IERs # 5, 6, 7, and 8, USFWS stated that none of the proposed projects evaluated in these IERs would be likely to adversely affect the manatee or brown pelican. Project plans for IER # 11 Tier 2 – Pontchartrain subsequently have been refined and finalized, as described above. Based on this additional project-specific information, CEMVN has reevaluated the potential for impacts to these two species.

Manatees potentially can occur in Lake Pontchartrain at the mouth of the IHNC and, although it is unlikely, they could enter the canal. The proposed action would involve construction and operation of flood control structures within the IHNC about 600 feet south of Lake Pontchartrain. A cofferdam would be in place across the canal for up to a year during construction of the gate structures. As a result, there is a small possibility that a manatee may enter the area where construction activities would occur. In order to minimize the potential for construction activities under the proposed action to injure or have other adverse effects on manatees during the construction period, and in accordance with recommendations from USFWS in their consultation letter, standard manatee protection measures (described in the IER) would be implemented for in-water construction activities.

After construction is completed, the only anticipated risk to the manatee would be potential trapping or injury caused by the operation of the sector gate or the two vertical lift gates on the IHNC. The sector gate and vertical lift gates would be kept open except during periods when there is a risk of storm-related flooding or during periodic maintenance activities. The likelihood of a manatee swimming 600 ft into the canal from the lake is minimal, and the potential for an individual manatee to then become trapped or injured by the infrequent closure of a gate is discountable. Assuming the standard protection measures for preventing disturbance or injury to manatees are employed during the period of construction, the direct effects of the proposed action are not likely to adversely affect the manatee.

The potential for indirect impacts on manatees due to adverse effects on the water quality of inshore areas of Lake Pontchartrain or the IHNC during the construction period would be minimized through the use of best management practices and adherence to regulations governing stormwater runoff at construction sites. As a result, potential indirect impacts on manatees from the proposed action would be insignificant. The proposed action would have no direct or indirect impacts that would contribute to cumulative impacts on this species. Thus, indirect or cumulative effects of the proposed action are not likely to adversely affect the manatee.

Brown pelicans are not known to nest in the project vicinity, and suitable nesting habitat is not present in the project area. Although brown pelicans forage for fish along the IHNC, they are able to readily avoid areas of construction activity and forage in the extensive areas of habitat available in Lake Pontchartrain or elsewhere on the IHNC. Thus, construction and operation of the proposed project would not be likely to have direct adverse effects on brown pelicans or their reproduction. Similarly, the proposed action would not reduce prey availability or otherwise indirectly impact brown pelicans, and it would not contribute to cumulative impacts on the pelican in conjunction with other projects in the region.

***CONTACT INFORMATION***

Please review the enclosed information and provide comments within 30 days of the date of this letter. The IER will not be signed until all environmental review and compliance requirements have been completed. A copy of the signed IER will be provided upon request.

Comments should be mailed to the attention of Ms. Laura Lee Wilkinson; U.S. Army Corps of Engineers; CEMVN-HPO; P.O. Box 60267; New Orleans, Louisiana 70160-0267. Comments may also be provided by E-Mail to Laura.L.Wilkinson@mvn02.usace.army.mil. Ms. Wilkinson may be contacted at (504) 862-1212, if questions arise.

Sincerely,

Joan M Exnicios

Joan Exnicios
Chief, Environmental
and Compliance Branch

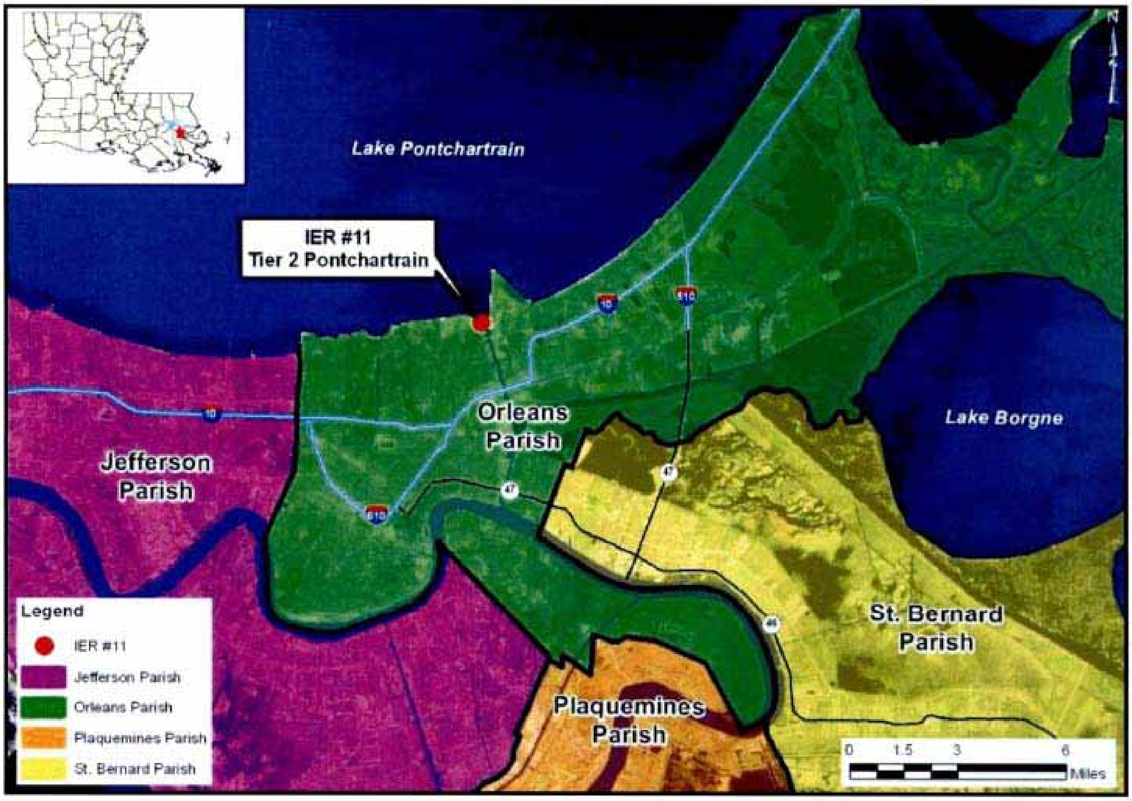


**Figure 1. IER # 11 Tier 2 Pontchartrain Project Vicinity Map**

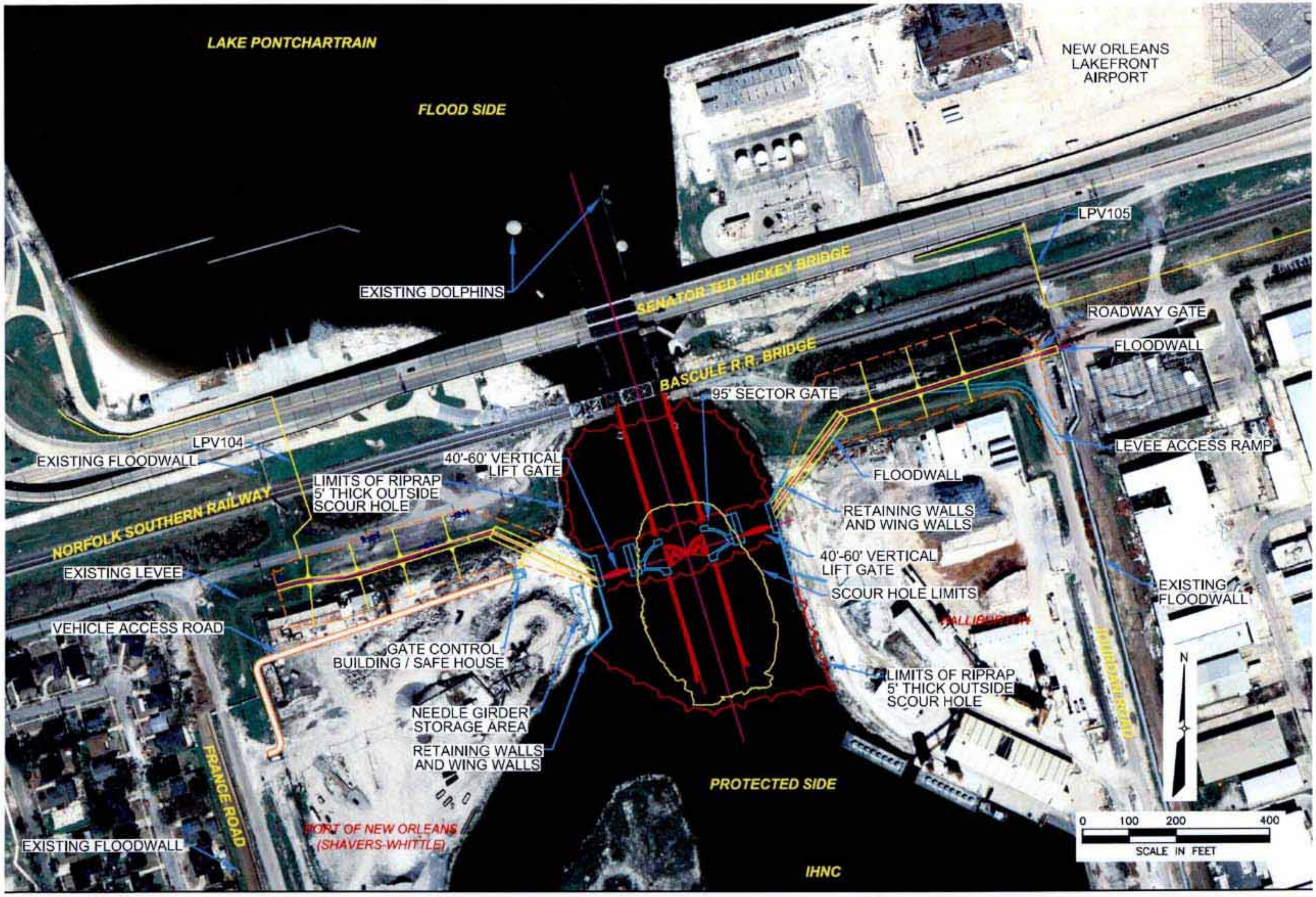


**Figure 2. Diagram of Proposed Action - Bridgeside Alignment 540 ft South of Seabrook Bridge**

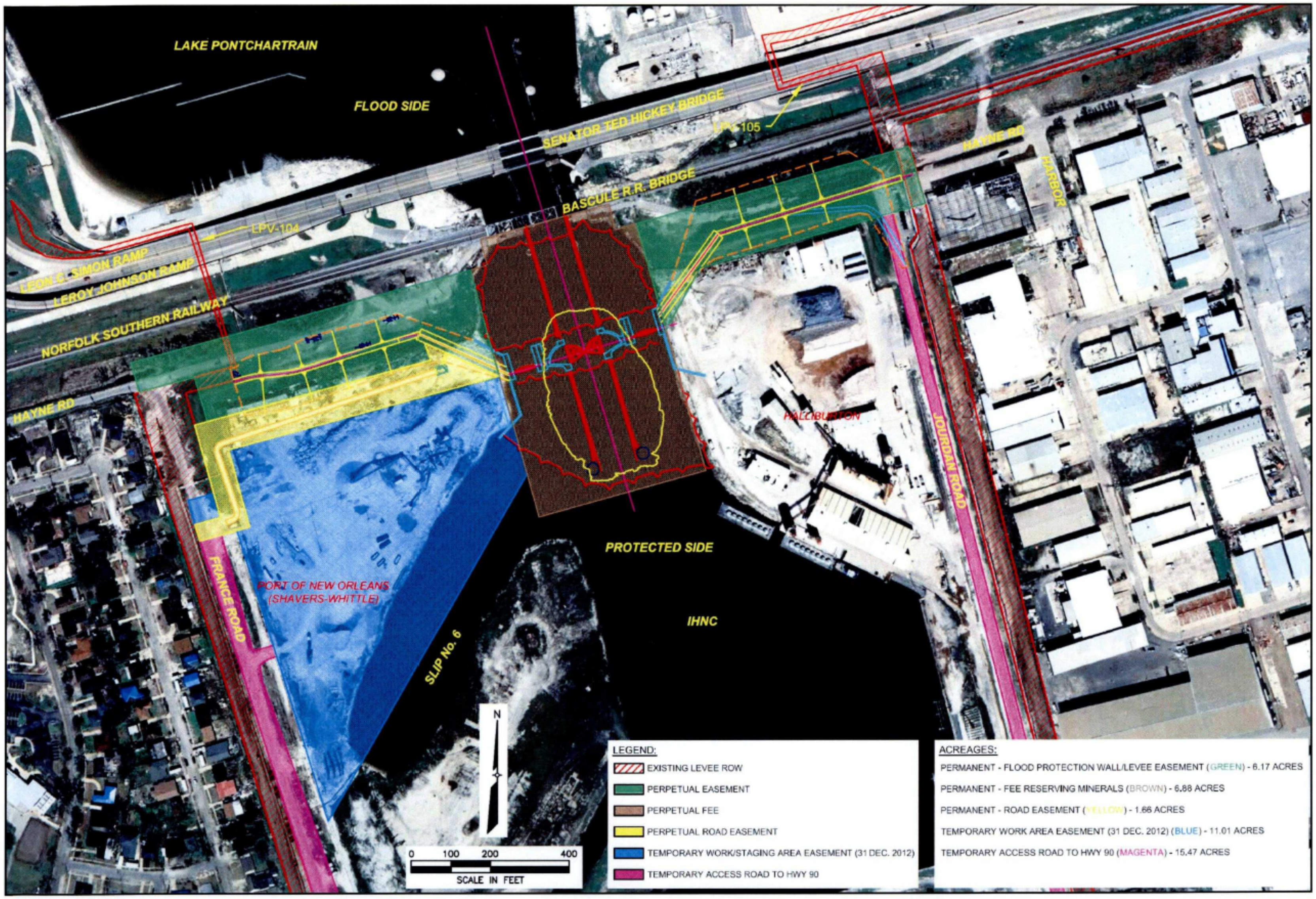


**Figure 3. Permanent and Temporary Easements for the Proposed Action**

**Bobby Jindal**
Governor

**Scott A. Angelle**
Secretary

# State of Louisiana

## DEPARTMENT OF NATURAL RESOURCES
## OFFICE OF COASTAL RESTORATION AND MANAGEMENT

November 9, 2009

Joan Exnicios
Dept. of the Army,
New Orleans District,
Corps of Engineers
P. O. box 60267
New Orleans, LA 70160-6267

RE: **C20090495,** Coastal Zone Consistency
**COE-NOD**
Direct Federal Action
Seabrook Structure, Inner Harbor Navigation Canal
**Orleans Parish, Louisiana.**

Dear Ms. Exnicios:

The above referenced project has been reviewed for consistency with the approved Louisiana Coastal Resource Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in the application, is consistent with the LCRP, provided LDWF is coordinated with in the development of the formal operations plan as agreed to by email of October 27, 2009. If you have any questions concerning this determination please contact Brian Marcks of the Consistency Section at (225)342-7939.

Sincerely yours,

Gregory J. DuCote
Administrator
Interagency Affairs/Field Services Division

GJD/JDH/bgm

cc: Dave Butler, LDWF
Elizabeth Davoli, OCPR
Richard Hartman, NMFS
Harold Daigle, LDOTD
Wynecta Fisher, Orleans Parish

MITCHELL J. LANDRIEU
LIEUTENANT GOVERNOR

# State of Louisiana

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT
DIVISION OF ARCHAEOLOGY

PAM BREAUX
SECRETARY

SCOTT HUTCHESON
ASSISTANT SECRETARY

February 20, 2009

Ms. Elizabeth Wiggins
Chief, Environmental Planning and Compliance Branch
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160-0276

Re: Management Summary
LA Division of Archaeology Report No. 22-3104-1
*Phase I Cultural Resources Survey and Inventory Performed for Lake Pontchartrain and Vicinity Project Pontchartrain 2 Portion of Individual Environmental Report Area 11 (IER#11): Orleans Parish, Louisiana*
R. Christopher Goodwin & Associates, Inc.

Dear Ms. Wiggins:

We acknowledge the receipt of your letter dated February 6, 2009, and two copies of the above- referenced draft report. We have completed our review and offer the following comments.

The management summary is well written and concise. We concur, based on the report findings, that the proposed undertaking within Pontchartrain 2 area (IER#11) will have no affect on historic properties.

Please review the enclosed technical comments and photocopied pages with comments/corrections noted. We look forward to receiving two copies of the final report with comments addressed, as appropriate. All site and site update forms will need to be finalized prior to the acceptance of the final report. If you should have any questions, please contact Stacie Palmer in the Division of Archaeology by email at spalmer@crt.state.la.us or by phone at (225) 342-5737.

Sincerely,

Scott Hutcheson
State Historic Preservation Officer

SH:SP:s

Enclosure: as stated

ALABAMA-COUSHATTA TRIBE OF TEXAS
571 State Park Rd 56 • Livingston, Texas 77351 • (936) 563-1100

RECEIVED
MAR 5 2009

March 3, 2009

Michael Swanda
U.S. Army Corps of Engineers
New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Dear Mr. Swanda:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe, our appreciation is expressed on your agency's efforts to consult us regarding Tier 2 of Individual Environmental Report #11 for Orleans Parish.

Our Tribe maintains ancestral associations within the state of Louisiana despite the absence of written records to completely identify Tribal activities, villages, trails, or grave sites. It is our objective to ensure any significances of Native American ancestry including the Alabama-Coushatta Tribe are administered with the utmost regard.

Upon review of the February 6, 2009 documents submitted to our Tribe, no impacts to religious, cultural, or historical assets of the Alabama-Coushatta Tribe of Texas should occur in conjunction with this proposal. Furthermore, we have no concerns regarding the Seabrook Railroad Bridge or historical districts within this region. In light of the absence of cultural resources to identify migratory routes utilized by ancestral Tribal members in the area, we concur with the "no adverse affect" recommendation.

In the event of inadvertent discovery of human remains and/or archaeological artifacts, activity in proximity to the location must cease and appropriate authorities, including this office, notified without delay. Should you require additional assistance, please do not hesitate to contact us.

Respectfully submitted,

Bryant J. Celestine
Historic Preservation Officer

Telephone: 936 – 563 – 1181 celestine.bryant@actribe.org Fax: 936 – 563 – 1183

# Choctaw Nation of Oklahoma

P.O. Box 1210 • Durant, OK 74702-1210 • (580) 924-8280

**Gregory E. Pyle**
Chief

**Gary Batton**
Assistant Chief


February 19, 2009

Elizabeth Wiggins
Dept. of the Army
New Orleans Dist. Corp of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160-0267

Dear Elizabeth Wiggins:

We have reviewed the following proposed project (s) as to its effect regarding religious and/or cultural significance to historic properties that may be affected by an undertaking of the projects area of potential effect.

Project Description: Inner Harbor Navigation Canal, Report #11-Tier 2

Project Location: Pontchartrain, Orleans and St. Bernard Parishes, Louisiana

Comments: After further review of the above-mentioned project (s), to the best of our knowledge, it will have no adverse effect on any historic properties in the project's area of potential effect. However, should construction expose buried archaeological or building materials such as chipped stone, tools, pottery, bone, historic crockery, glass or metal items, or should it uncover evidence of buried historic building materials such as rock foundations, brick, or hand-poured concrete, this office should be contacted immediately @ 1-800-522-6170 ext. 2137.

Sincerely,

Terry D. Cole
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma

By: Caren A. Johnson

Caren A. Johnson
Administrative Assistant

CAJ: vr

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## APPENDIX F

## PUBLIC MEETING MINUTES

- **3 March 2009 Public Meeting Summary**: Individual Environmental Reports 4 and 11 Tier 2 Pontchartrain New Orleans Lakefront Levees and Floodwalls, Inner Harbor Navigation Canal.

  Available online at:
  http://www.nolaenvironmental.gov/nola_public_data/projects/usace_levee/docs/original/Mar309IER411Tier2PubMtgSumm.pdf

- **5 March 2009 Public Meeting Summary**: Individual Environmental Report 11 Tier 2 Pontchartrain Inner Harbor Navigation Canal Navigable Floodgates, Orleans and St. Bernard Parishes.

  Available online at:
  http://www.nolaenvironmental.gov/nola_public_data/projects/usace_levee/docs/original/5Mar09IER11Tier2PubMtgSumm.pdf

To request hardcopies of public meeting presentations and/or transcripts,
Please contact Joan M. Exnicios at 504-862-1760.